THE PAPER INDUSTRY
and PAPER WORLD
EDUCATIONAL NEWS MAGAZINE—JUNE, 1945

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JUN 29 1945

"Beachhead Secure"

..with YOUR help ?

Drawing reproduced by courtesy U. S. Coast Guard; sketched on ... by Combat Artist Norman ... Thomas, Chief Specialist, USCG.

TO THE AMERICAN PEOPLE:

Your sons, husbands and brothers who are standing today upon the battlefronts are fighting for more than victory in war. They are fighting for a new world of freedom and peace.

We, upon whom has been placed the responsibility of leading the American forces, appeal to you with all possible earnestness to invest in War Bonds to the fullest extent of your capacity.

Give us not only the needed implements of war, but the assurance and backing of a united people so necessary to hasten the victory and speed the return of your fighting men.

William S. Paley
Dwight D. Eisenhower

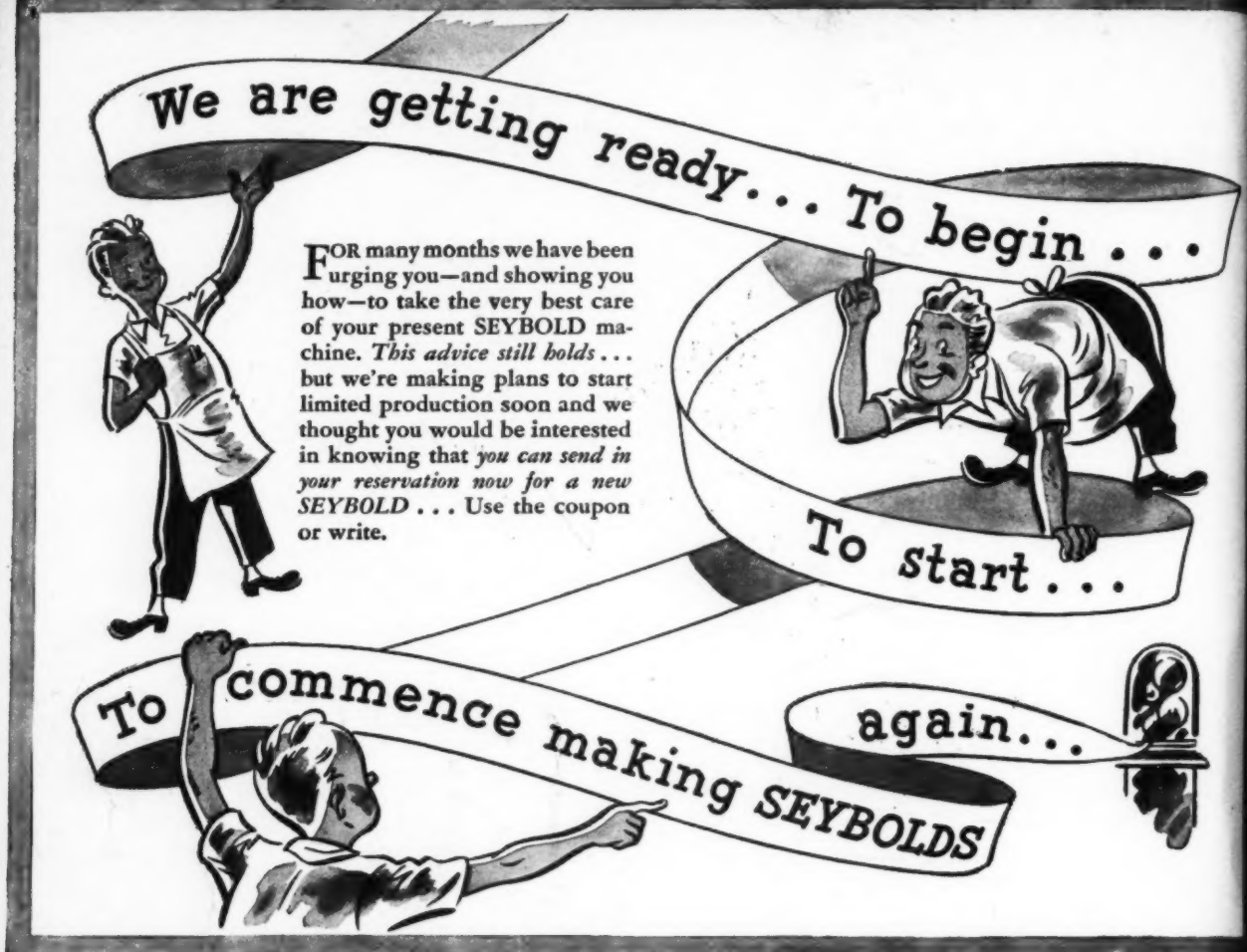
... THEIR LEADERS SPEAK FOR EVERY AMERICAN FIGHTING MAN:

BUY WAR BONDS TO THE LIMIT!

(that's the least we at home can do)

Support the Seventh War Loan!

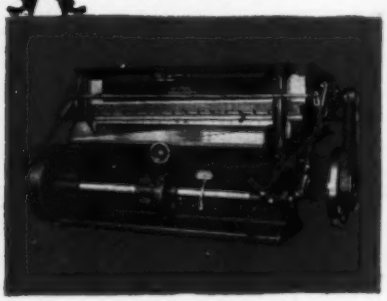
THE PATTERSON FOUNDRY & MACHINE CO.
EAST LIVERPOOL, OHIO, U. S. A. Richard L. Cameron, President



FOR many months we have been urging you—and showing you how—to take the very best care of your present SEYBOLD machine. *This advice still holds* . . . but we're making plans to start limited production soon and we thought you would be interested in knowing that *you can send in your reservation now for a new SEYBOLD* . . . Use the coupon or write.

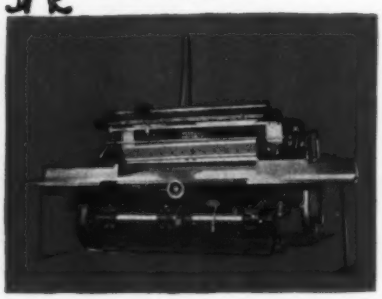
CUTTER

I'm the precision machine
Of massive design.
For accuracy—tops!
For speed—super fine!



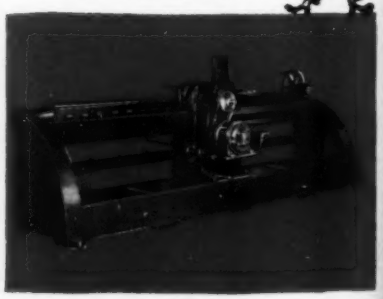
SPACER

For making a series
Of accurate cuts
I'm a time-saving guy
With plenty of guts!



GRINDER

Keen, true edges
That's my trade
With minimum waste
On any straight blade!



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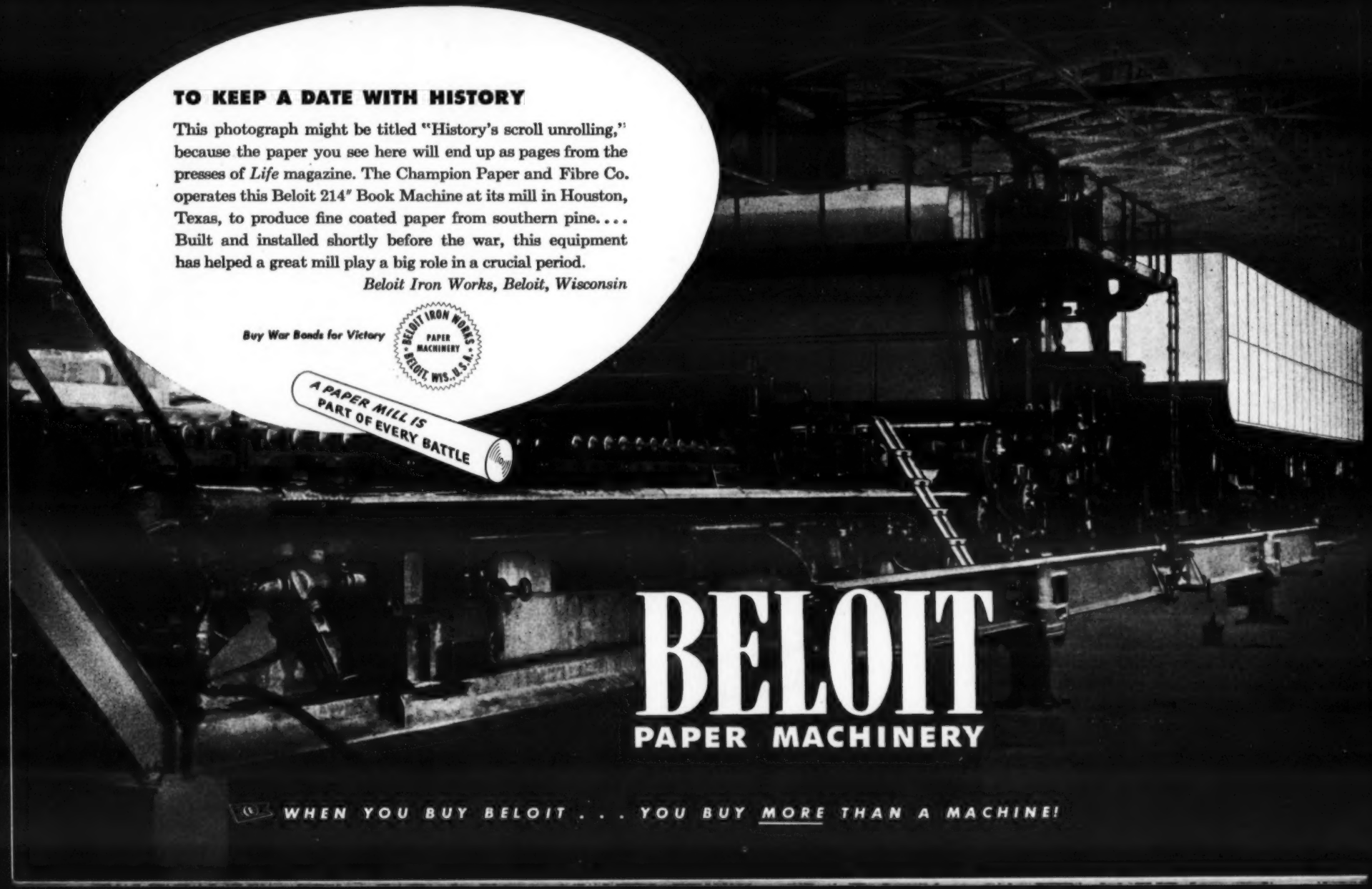
TO KEEP A DATE WITH HISTORY
This photograph might be titled "History's scroll unrolling," because the paper you see here will end up as pages from the presses of *Life* magazine. The Champion Paper and Fibre Co. operates this Beloit 214" Book Machine at its mill in Houston, Texas, to produce fine coated paper from southern pine.... Built and installed shortly before the war, this equipment has helped a great mill play a big role in a crucial period.
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Buy War Bonds for Victory
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BELOIT WIS. U.S.A.
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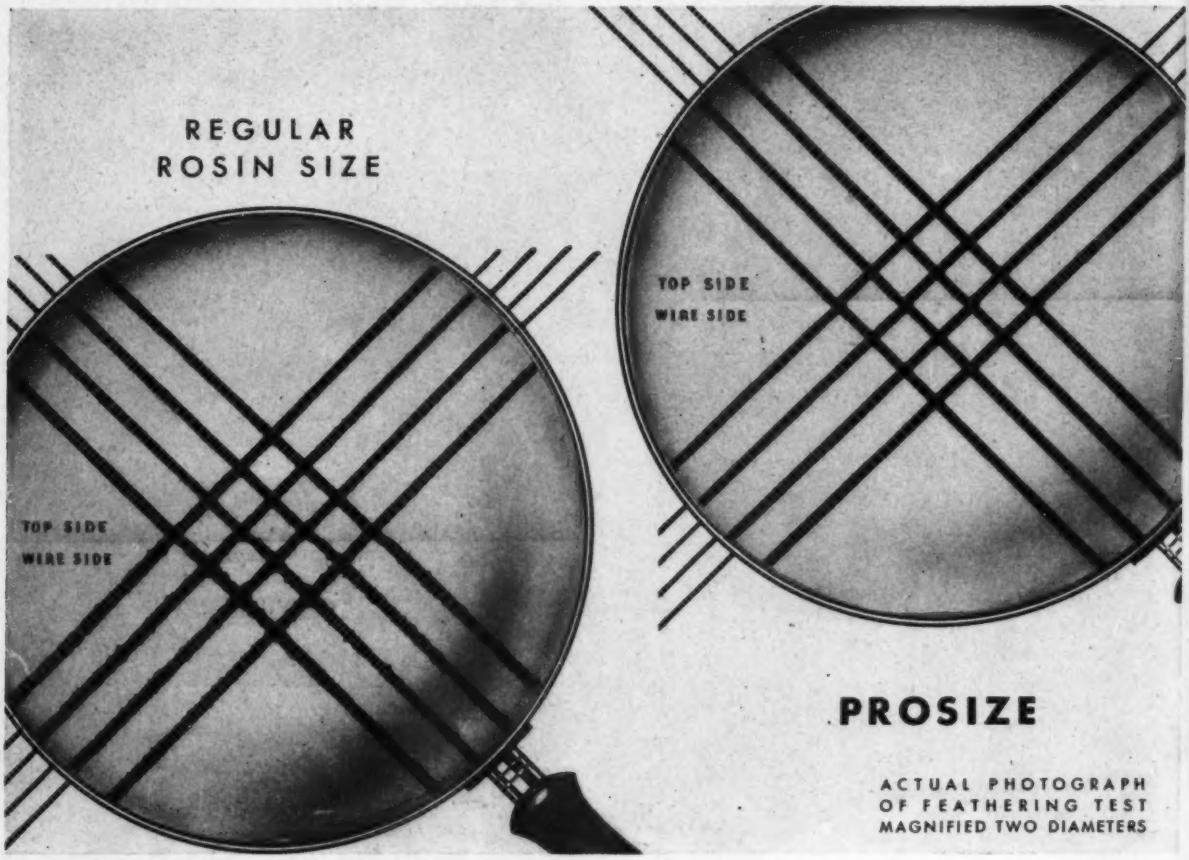
WHEN YOU BUY BELOIT . . . YOU BUY MORE THAN A MACHINE!



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Note that most of the bending takes place in the perforated rear portion of the blade. The stiffening effect of this bending is dissipated by the perforations, and the forward portion of the blade remains a flat, flexible ribbon of metal.

LODDING Type K Floating Blade Holder represents simplification of design—one piece of rigid brass . . . maintenance no problem . . . changing blade a matter of seconds. LODDING FLOATING BLADE DOCTORS clean safely any paper machine roll that requires doctoring. Engineered for each position on every machine.

New Machine Buyers Are Specifying Lodding Doctors as Original Equipment.

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LODDING ENGINEERING CORPORATION

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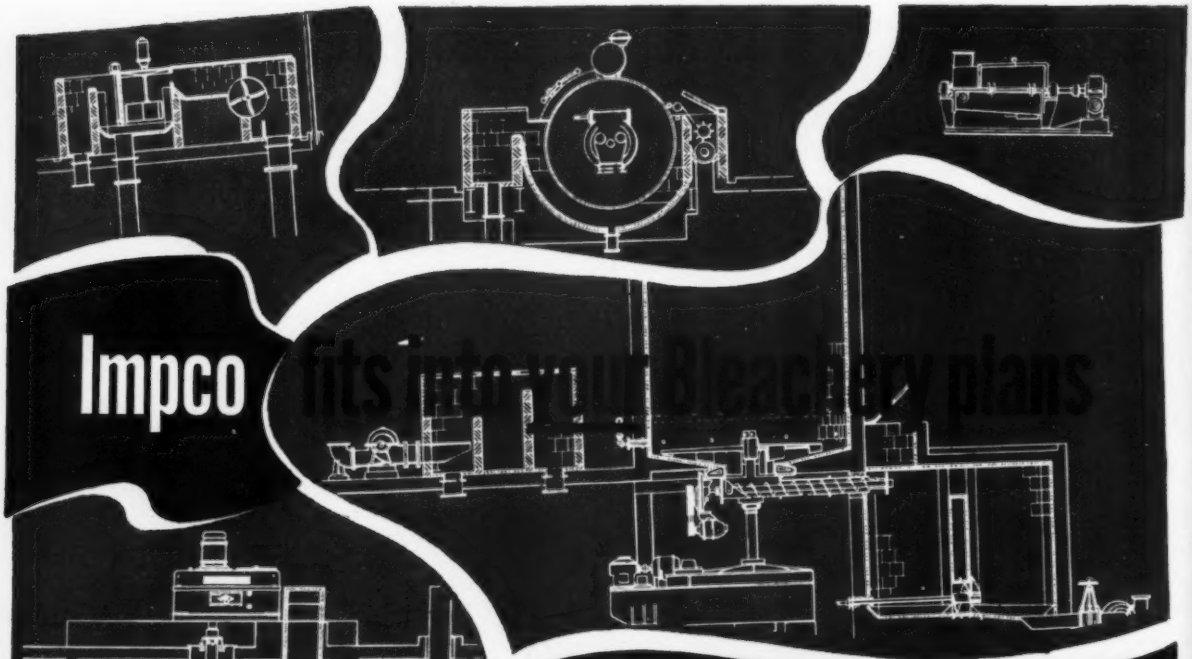

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THE PAPER INDUSTRY and PAPER WORLD is indexed regularly in "The Industrial Arts Index." An index to each volume is issued annually by the publisher as Section Two of the April number.

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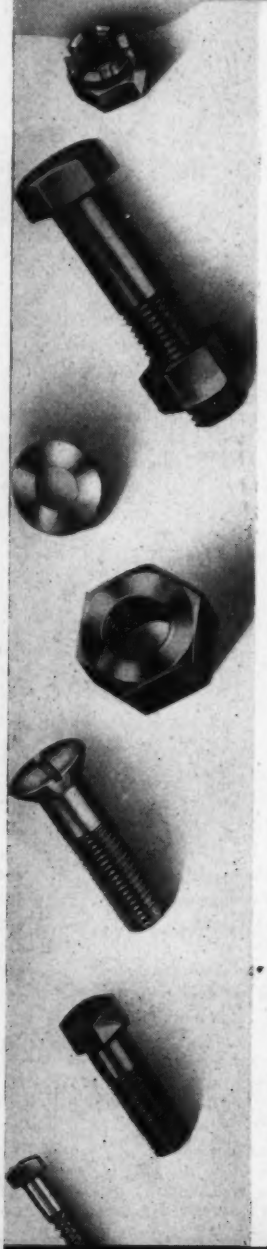
at small cost



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MURRAY PAPERMILL *and* WOODROOM *Equipment*

Here are a few of the better known Murray papermill and woodroom equipment that for years has been serving the industry, and two of the more recent developments. Complete details upon request, especially on new machines now being developed to aid operating conditions.

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. . . through the use of HORTON ELEVATED STORAGE

● You can provide efficient fire protection at your mill by installing an automatic sprinkler system and an elevated steel tank providing gravity water pressure. With a reserve of water held in an elevated tank above your property at all times, ready to flow the instant a blaze opens a sprinkler head, fires will be quenched before they have a chance to spread and cause extensive damage.

Three typical examples of Horton elevated storage tanks providing dependable fire protection for paper mills are shown in the accompanying views. Installations for automatic sprinkler service usually range in size from 50,000 to 250,000 gals. and are built to meet the requirements of your insurance rating organization and the inspection department of your insurance company.

Write our nearest office for quotations on standard capacity elevated tanks to meet *your* plant requirements.

● *Above Right: This 100,000-gal. elevated tank was installed for sprinkler service at a pulp mill in Florida. It is 125 ft. to bottom. In the lower left-hand corner of the picture there is a 36 ft. diam. by 22 ft. suction tank.*

● *Right: 50,000-gal. Horton elevated tank for fire protection at a pulp mill in North Carolina. It is 125 ft. to bottom.*

● *Left: This photo shows a 125,000-gal. Horton elevated tank 125 ft. to bottom, providing gravity water pressure for a sprinkler system at a paper mill in Texas.*

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You can get these major advantages from Fairbanks-Morse...because Fairbanks-Morse designs and builds all components of an outstanding line of complete pumping units. To see a qualified engineer about any pumping job, write Fairbanks, Morse & Co., Fairbanks-Morse Bldg., Chicago 5, Ill.

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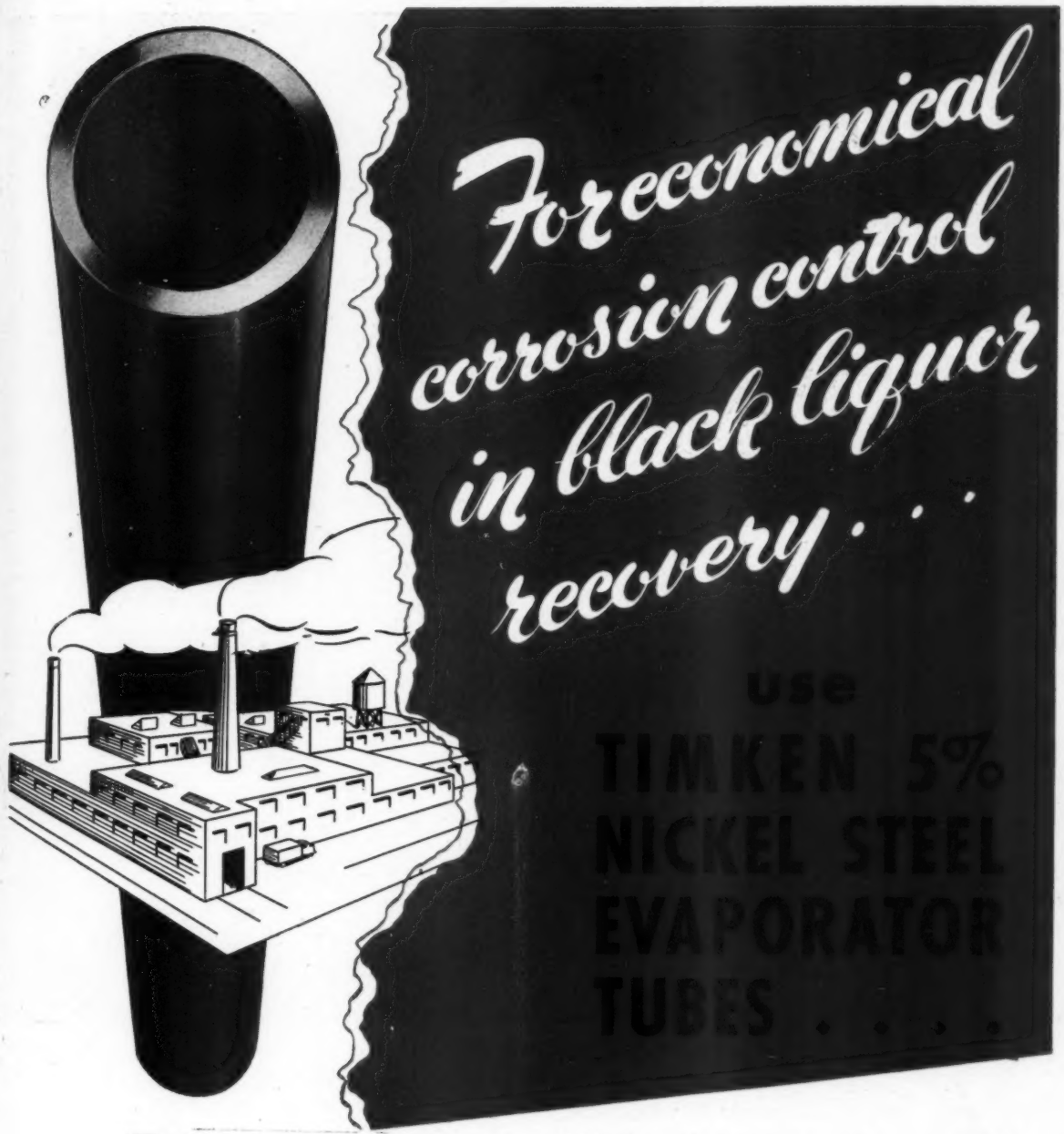

Timken Seamless Tubes of 5% Nickel Steel provide an economical solution to evaporator tube corrosion problems caused by Black Liquor.

They offer maximum tube life per dollar invested and can be depended upon to keep equipment in service for longer periods of time which reduces wear and tear on headers *effecting still greater savings.*

For greater production and greater profits use Timken Seamless Tubes of 5% Nickel Steel. We will be glad to send you specifications of these tubes if you write a request on your firm's letterhead. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
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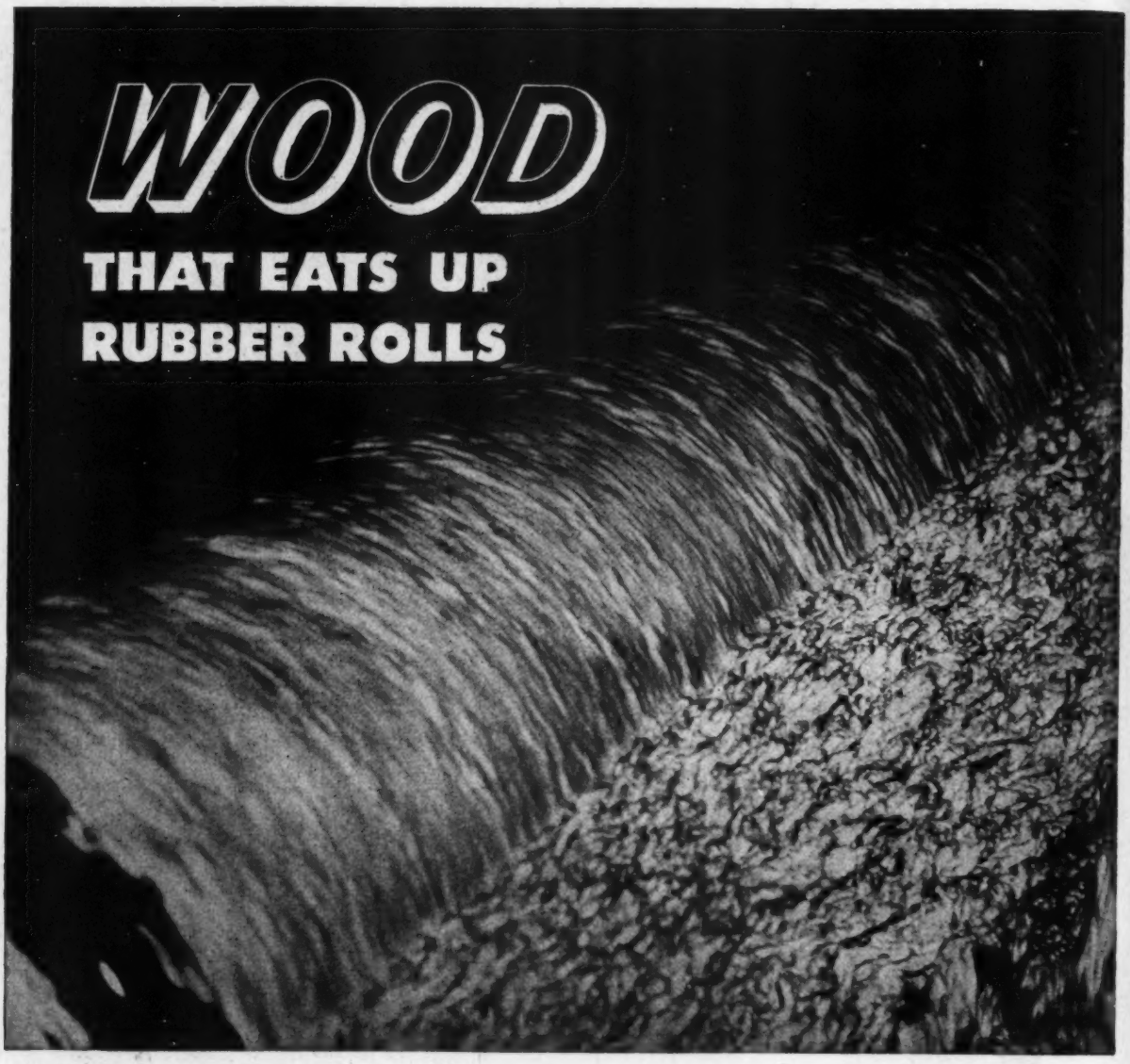
SEAMLESS STEEL TUBES

WOOD
THAT EATS UP RUBBER ROLLS



In this paper mill, it was found that the decker couch rolls were literally "eaten up" by certain materials inherent in the ground wood stock.

After several such rolls, made of natural rubber, had disintegrated, U.S. Rubber Engineers were consulted. On their recommendation, a roll fabricated of a special synthetic rubber compound was installed. This proved entirely "indigestible" to the wood stock... has already delivered many more months of service than rolls tried previously... is setting up a record for steady, trouble-free service.

Such practical applications of rubber engineering are the result of United States Rubber Company's long and exhaustive study of rubber compounding, and the development of special compounds for specific industrial needs.

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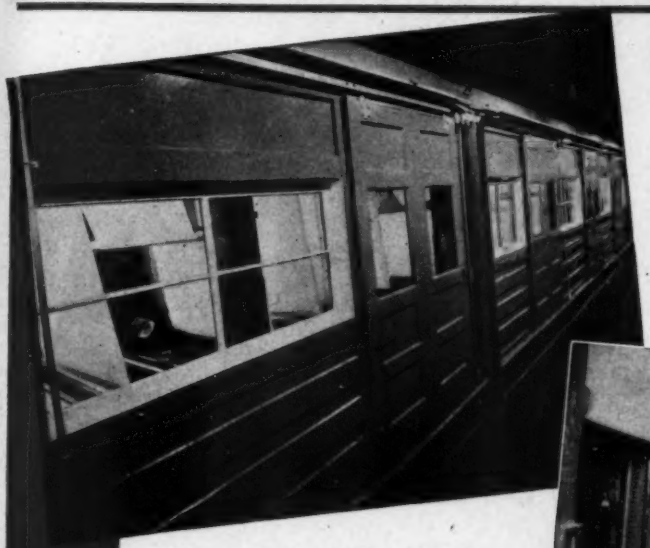
in Electrically-Operated Dry Loft Machine



Above—Exterior of Aiken Dry Loft Machine at the Strathmore Paper Co., West Springfield, Mass.

Right—Interior of one section —Type T Heavy-Duty Reliance D-c. Motor in background.

● Reliance Motors are delivering completely satisfactory results—far beyond anything obtainable with the old type of drive and manual adjustments—in Dry Loft Machines like the one pictured above. Adjustments formerly made manually are handled instantaneously and automatically—to allow for stretch and shrinkage—to maintain desired tension—and to keep the paper coming through in steady production, without breaks.

Hours formerly lost in making adjustments for a new order of paper are now saved, as no preliminary adjustment is necessary. Total space occupied by the Reliance drive equipment is about one-fifth of that formerly required. First cost and maintenance are both lower.

This is only one of the many ways in which Reliance Motor-Drive is being used to help produce better results in various departments of paper mill operation. Further information will gladly be furnished; just call the nearest Reliance office.

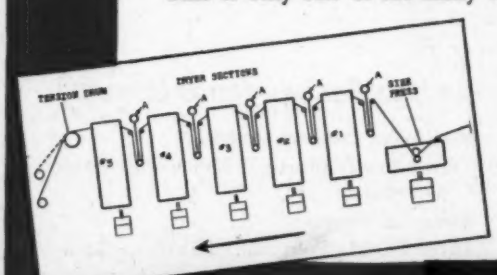


Diagram of 5-section Dry Loft. Each section has a 2 h. p. motor, with dancer-roll rheostat —marked "A". Draw drum and reel have separate motors. All sectional motors in the range operate in a variable-speed V°S System powered by A-c. mill circuit.

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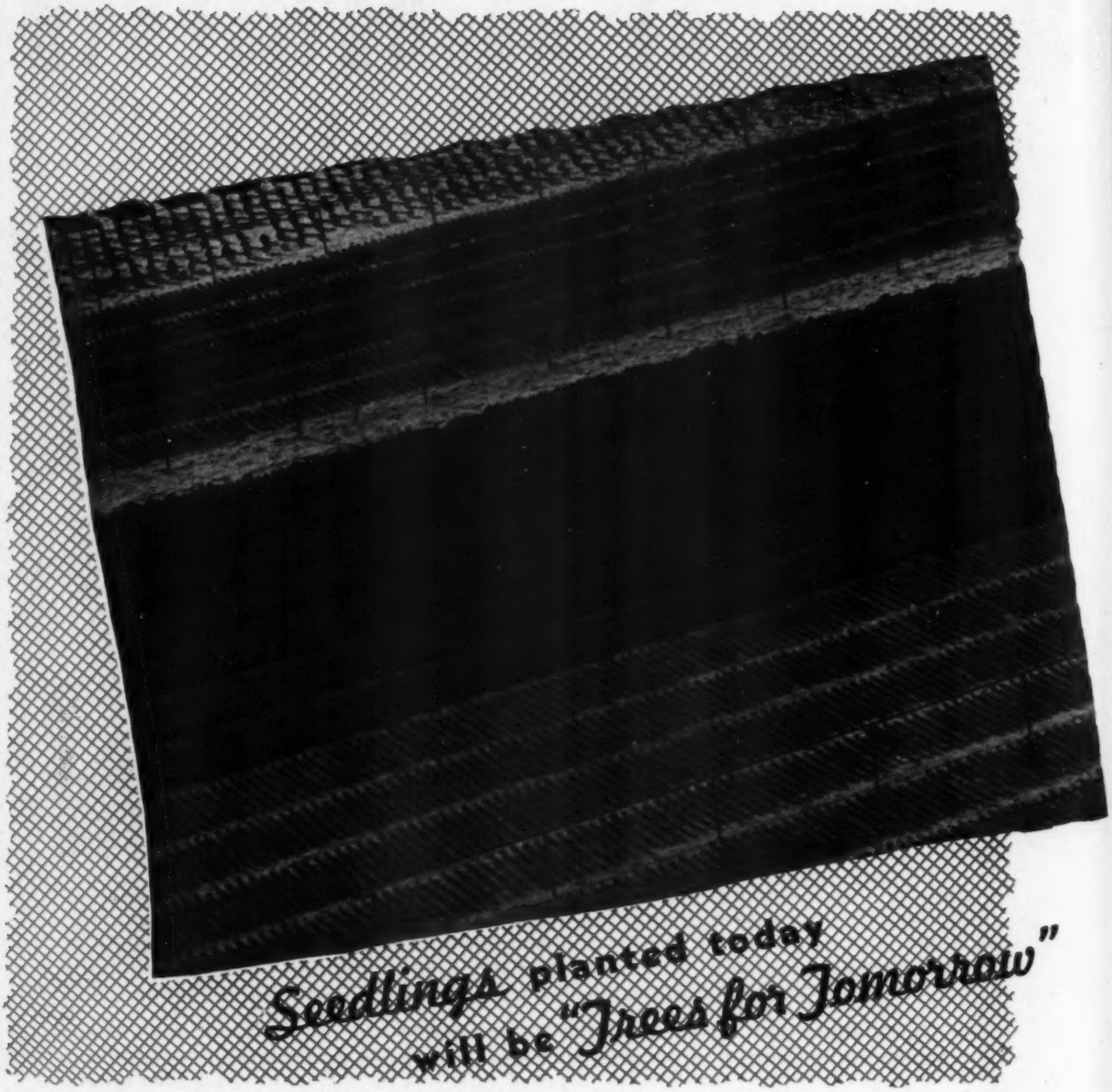

Trees are Nature's most precious crop, and man has learned the necessity of perpetuating this crop that he may build a reserve which will insure his future needs.

Shown on this page are seedlings when planted some eight years ago by a prominent paper manufacturer. Seedlings then, they now have been transplanted and are growing into "Trees for Tomorrow."

In this Issue (Trade Winds)

Nine-Point Forestry Program
"Trees for Tomorrow" Scholarship Prizes Awarded
Memorial Forests
Three Florida Pulp Mills Distribute Seedlings
Pulpwood Field Days Held in Pennsylvania
Wood Is Essential to Finishing the War
Plan Experimental Forest in S. E. Virginia

Trade Winds

Nine-Point Forestry Program

▶▶▶ Producers of over two-thirds of all U. S. forest products have crossed industry lines for the first time and joined forces for a drive to insure increased reproduction and growth in U. S. forests, according to an announcement May 9 by P. H. Glatfelter, Spring Grove, Pennsylvania, chairman of a newly organized Forest Industries Council.

Manufacturers of pulp, paper and lumber who are members of the American Paper and Pulp Association, the American Pulpwood Association, and the National Lumber Manufacturers Association have approved a nine-point program seeking improved production in U. S. woodlands which have carried a heavy load during the war years.

The new common standard for forest management calls for private industrial users of commercial forests to seek greatly increased fire protection for all lands, adopt and extend measures for continuous production and reforestation on cut-over lands, encourage private ownership for all lands which can be profitably operated for continuous production, seek public acquisition of lands which cannot be operated profitably privately, advocate taxes which encourage private ownership of timberland, support public regulation of cutting practices where necessary under state law, seek adequate financing for state forestry organizations, and develop a more complete utilization of wood now being harvested.

"The U. S. has sufficient forest type land to produce a sustained harvest equal to our normal requirements of wood. The successful application of this new program should go a long way toward assuring a capacity growth and abundance of forest products of all kinds continuously," said E. W. Tinker, secretary of the American Paper and Pulp Association, in commenting on the policy statement which he said represented the first occasion on which all major users of American forests had joined in a common undertaking.

Forest products manufacturers represented by the newly found national organization include 225 pulp and paper manufacturers, approximately 175 producers of pulpwood, and about 1,100 lumber manufacturers in all parts of the United States. The Council was formed in 1943 as the instrument of common action for the three industries. The new forest policy was developed early this year. Its text is as follows:

Permanent industries capable of producing continuous supplies of forest products are essential to the national welfare. The necessity for wise use of our forest resources in maintaining such industries and the communities dependent upon them is recognized.

Having faith that private enterprise and initiative can provide the most effective management, use, and renewal of our Nation's forests, the Forest Industries Council pledges united leadership for betterment of America's forests, and the attainment of continuous forest production. In the fulfillment of this leadership, the Forest Industries Council agrees to:

1) Promote the extension of permanent and dependable protection against fire to all forest lands, irrespective of ownership.

2) Urge all forest owners and forest operators to develop and adopt forest practices designed to insure the continuous production of timber on all areas as harvested, irrespective of ownership.

3) Confirm the sound economic policy of encouraging private ownership of lands which are being or can be profitably managed for continuous production of forest crops, and encourage a national land policy to include the sale and exchange of public lands in order to restore desirable lands to private ownership as well as to consolidate public holdings.

4) Encourage public ownership and practical management of forest lands which are incapable of producing sufficient wood to maintain profitable private ownership.

5) Advocate equalization of state and local taxes on forest lands that reasonably support their fair proportion of local responsibilities, and that encourage private ownership of forest land.

6) Support in each forested state a competent, adequately staffed and financed state forestry organization, qualified to manage state-owned forest lands, to administer and enforce state laws relative to privately owned forest lands, and to provide adequate cooperation with all timberland owners in the state in solving forestry problems.

7) Support public regulation when necessary or desirable, to be administered under state laws. The need for desirability of such regulations and its scope if undertaken to be determined by the people of each state.

8) Co-operate with public and private agencies in the control or abatement of major forest insects and diseases.

9) Develop more complete utilization of forest products.

Officers of the Council and members who represent the three industries are:

General Chairman: P. H. Glatfelter, P. H. Glatfelter Company, Spring Grove, Pennsylvania.

Deputy Chairman: S. R. Black, Weyerhaeuser Sales Company, St. Paul, Minnesota.

Secretary: G. H. Collingwood, Chief

Forester, National Lumber Manufacturers Association, Washington, D. C.

American Paper and Pulp Association

Member

Sydney Ferguson, Mead Corporation, 230 Park Avenue, New York, New York

C. H. Sago, Kimberly-Clark Corp., Neenah, Wisconsin.

Alexander Calder, Union Bag and Paper Company, New York, New York

Ex-officio

Earl V. Tinker, Secy., American Paper and Pulp Association, 122 East 42nd Street, New York, New York

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Luther O. Griffith, Griffith Lumber Company, Shamrock, Florida.

C. C. Sheppard, Louisiana Central Lumber Co., Clarks, Louisiana

Ex-officio:

Henry Bahr, Acting Secy., National Lumber Manufacturers Ass'n, Washington, D. C.

◆

TREES FOR TOMORROW, INC., ANNOUNCE FIVE FORESTRY SCHOLARSHIP WINNERS

Five Wisconsin Valley boys won $2,500 on May 25, when forestry scholarship winners were announced by Trees for Tomorrow, Inc., reforestation organization of the Wisconsin Valley paper mills.

The five successful candidates from the twenty-nine participating Wisconsin Valley high schools are: Robert Wolf, Arbor Vitae-Woodruff High School; John Marcouiller, Merrill High School; Harold Berndt, Wausau High School; Herman A. Meyer, Alexander High School, Nekoosa; and John Krause, Pittsville High School. Two alternates were named in each district.

Candidates who entered competition for the scholarship, first of its kind offered to high school students in the country, were judged on a point system from an entry blank worked out in co-operation with the state conservation department, an essay, and a personal interview. Schools of the valley were divided into five districts by the Department of Public Instruction, Madison.

Folke Becker, president of the Rhinelander Paper Company and president of Trees for Tomorrow, Inc., in announcing the winners, said, "Interest shown this first year indicates a new awareness on the part of our citizens of tomorrow in the vast job that confronts America in the rebuilding and management of the 670 million acres of forest land in this country." He pointed out that there will be a vital place in the postwar world for those trained in the art and science of forestry.

The future foresters may specialize in any phase of forestry and attend any one of twenty-seven accredited forestry schools in the nation.

The scholarship program wound up the first years activities of Trees for Tomorrow, Inc. During the spring planting season 750,000 free seedling trees were distributed to farmers—two seedlings for each tree cut. With the co-operation of the conservation Department and state extension service four new school forests and one memorial forest were started, while member mills of Trees for Tomorrow, Inc., planted 1,250,000 trees on their own forest holdings.

THREE FLORIDA PULP MILLS DISTRIBUTE PINE SEEDLINGS

Three Florida pulp mills distributed, free, approximaetly 1,500,000 pine seedlings for reforestation purposes during the past planting season.

In a report dated May 28, Assistant State Forester R. U. Titus summarized the planting done in the last 12 months. This report showed trees distributed by the following Florida companies:

Container Corporation of America, Fernandina, 1,009,000 trees

International Paper Company, Panama City, 370,000 trees

Florida Pulp and Paper Company, Pensacola, 86,000 trees

The trees were provided to farmers and landowners in counties in the vicinity of each mill, but the combined coverage included all of north Florida and much of the central part of the State. The same mills have placed tentative advance orders with the State nursery for the same distribution next season.

WOOD IS ESSENTIAL TO FINISHING THE WAR

"Increased production of pulpwood and lumber in the United States is absolutely essential to the successful prosecution of the war in the Pacific," according to a recent statement by J. A. Krug, chairman of the War Production Board. He re-emphasized the fact that essential requirements for forest products have not been lessened by the end of the war in Europe.

WPB officials charged with the production of vital war materials have expressed grave concern over the current low receipts of pulpwood and the continued drain on inventories at pulp mills. This critical situation is forcing many pulp and lumber mills to operate at less than capacity, Mr. Krug stated.

Lumber, pulpwood and wood pulp production remain on the production urgency list of vital war materials, he pointed out. Sawlog and pulpwood production, normally seasonal operations in many areas, must be vigorously continued throughout the summer and fall, if serious shortages and mill shutdowns are to be averted.

Extremely bad winter weather in some producing areas, coupled with early ice and snow break-ups in the North, made it difficult, if not impossible, to move large amounts of wood cut last winter, Mr Krug said, adding that this partially explained why current mill receipts are behind last year's. Labor and transportation continue to be two of the primary problems in this industry. Shortages of trucks, tires, freight cars, wood operation equipment and men have contributed to the seriousness of this production program.

The War Production Board has set an over-all production goal of 40,000,000,000 feet of lumber and 16,000,000 cords of domestic pulpwood for 1945. As current reports indicate production is substantially behind these goals, every effort to overcome existing difficulties must be made and production stepped up, Mr. Krug concluded.

◆

PLAN TO ESTABLISH AN EXPERIMENTAL FOREST IN SOUTHEASTERN VIRGINIA

Plans for the establishment of an experimental forest in southeastern Virginia are developing rapidly, according to an announcement last month by Virginia State Forester, George W. Dean. Some 2,000 acres fit into the present plans which will go into work during the latter part of the summer.

PAPER · · · America's 6th Industry

PAPER DUST MASKS

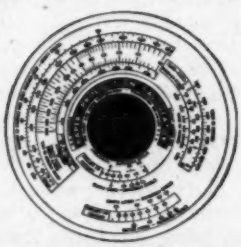
(NEWS ITEM: *Face masks to protect war workers from dust are being made of paper.*)

Paper that can be stitched and washed and ironed like a fabric is now being used to make caps and face masks to protect war workers from dust. Tiny pores in the paper permit the air to move through it freely, but strain out dust particles of ordinary size.

Paper for making practice bombs . . . Paper for shell case coverings . . . Paper bags for shipping guns . . . Paperboard rings for rolling bombs . . . New uses for paper, calling for new standards of lightness and toughness, new standards of quality in performance. New responsibilities—new opportunities for the Pulp and Paper Industry.

Puseyjones men and production facilities are at War—and Industry at War is Industry thinking and working at hitherto unheard of speeds. Our Research and Development Committee, working on the problems of America at War, is finding many practical and technical advantages that will be of incalculable value to America at peace—to the Paper-Making Machinery of the future.

We are in a position to repair or modernize existing machines where essential to the war effort and as approved by the War Production Board.



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THE SIGN OF TRADE MARK SUPERIOR QUALITY

One of a series to be located along the Atlantic Coast, the experimental forest will be made possible through a recent congressional appropriation for timber research. A $300,000 fund will become available July 1, and it is expected that approximately $30,000 will be provided for the Virginia station.

The experimental forest will be administered by the Appalachian Forest Experiment Station of the Research Division of the United States Forest Service in consultation with Virginia forest land owners and the Virginia Forest Service.

◆

PULPWOOD FIELD DAYS HELD IN PENNSYLVANIA

Pulpwood, critically-needed war-essential material that is needed in greater quantities to help beat the Japs, has become a household word in timbered Pennsylvania areas where recently four extension Pulpwood Field Days were conducted by the Agricultural Extension Service of the Pennsylvania State College to further the pulpwood production program—a program that promises to help shorten the war.

Purpose of the pulpwood meets was to emphasize the urgent need for more pulpwood and to inform producers on how to process wood most efficiently in order to harvest the greatest possible amount with limited equipment and labor. In charge were the county agents and Frank T. Murphey, extension forester at the State College, who instructed the woodsmen on all steps in the pulpwood operation. All four events were essentially educational.

Nearly 300 men and boys, some of them novices and some skilled woods operators, participated. Most of them were farmers. They processed more than 20 cords of wood. This was sold and the proceeds given to charity. State and federal officials attended. Among them were representatives of the War Production Board who added emphasis to the need for more pulpwood for war uses.

At each meet workers had opportunity to acquaint themselves with all kinds of tools required for efficient pulpwood production. These included power saws which were used in felling and bucking. A caterpillar tractor pulled the logs to roadways at one meet. A power saw was used to fell the largest tree, a 200-year-old white oak which measured 43 inches across the stump.

The State made three of the sites available. One was on game land, the other two on land of the State Department of Forests and Water whose secretary, James A. Kell, is chairman of Governor Edward Martin's Emergency Forest Products Committee, of which Forester Murphey is a member.

Four pulpwood mills in the State co-operated by financing free luncheons and so shared with the Pennsylvania Farmer and Periodical Publishers in donating prizes for woods contests in sawing, peeling, and felling. Prizes included a War bond at each of the four meets.

◆

MEMORIAL FORESTS

"How to Establish a Memorial Forest" is outlined in a booklet issued by Trees for Tomorrow, Inc., Merrill, Wisconsin. This group is a non-profit organization of the Wisconsin Valley papermaking industry founded to help advance reforestation in the State of Wisconsin. This booklet supports the idea of dedicating memorial forests as tributes to the men who are fighting and dying in the present world conflict, and quotes from Louis Bromfield, who wrote recently in a U. S. Forest Service Bulletin:

"To me it seems that the new idea of a living memorial is one that should have the most serious consideration from every community, large and small. Most of the boys who lost their lives in this war as in all wars, loved the out-of-doors. They loved trees and swimming and fishing. They loved cooking a good steak over an open fire; they loved shooting ducks and pheasants and rabbits. Out of these things came the boys who made our best fliers, our best sailors, our best fighters. I think any or all of them would prefer to be remembered by a forest or a game sanctuary or a lake, than by some useless and possibly ugly cast-iron statue or by piles of cannon balls hung around with chains."

◆

SCOTT PAPER COMPANY BUYS AUTOMATIC PAPER MACH'Y CO.

A late release from the Scott Paper Company, Chester, Pennsylvania, announces that the company has acquired all the assets of the Automatic Paper Machinery Company, Inc., manufacturer of Cut-Rite wax paper and San Fay facial-type toilet tissue. These assets also include papermaking equipment at Milford, New Jersey, and converting facilities at Hoboken, New Jersey, and Sandusky, Ohio.

R. H. Rausch, president of the Automatic company, is to become a vice president of Scott Paper Company and a member of its board of directors. He was a co-founder of the Cut-Rite business in 1924.

Under the terms of the transaction, the announcement states that the R. B. Davis Sales Company will continue to handle the sales of Cut-Rite and

R. H. Rausch

San Fay until August 1, 1945, when Scott will take over complete distribution. Cut-Rite, and San Fay are distributed through the same wholesale channels and retail outlets as Scott products. No immediate change in marketing policies affecting these products is contemplated.

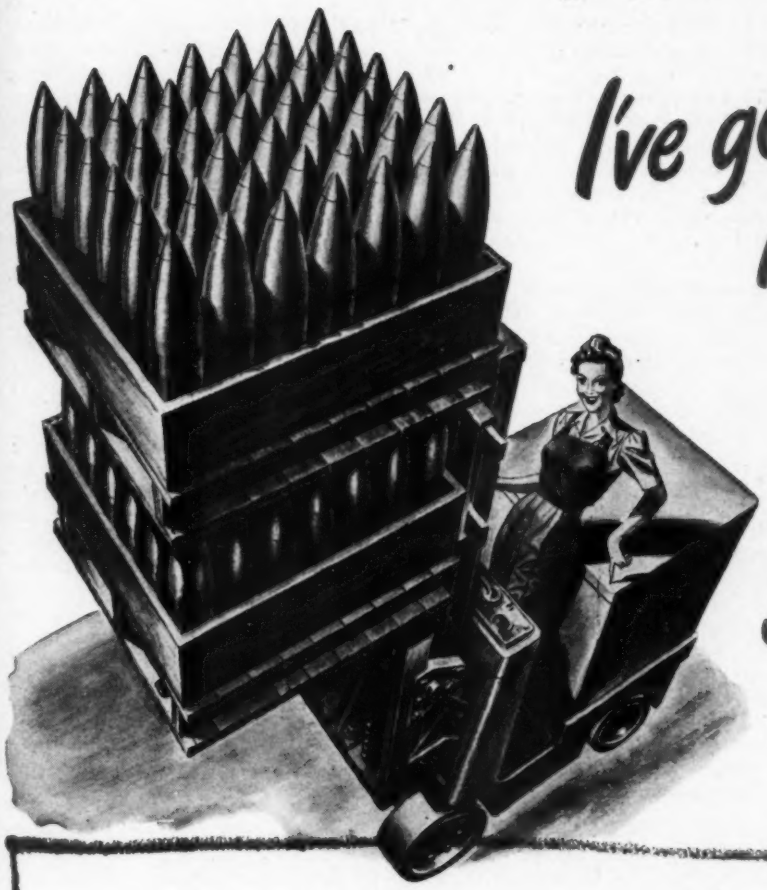
Mr. Rausch will continue to direct the operations of the Automatic company as a division of Scott Paper Company. He is well-known throughout the paper industry and in merchandising circles and at one time was connected with the International Paper Company. During the past four years, Scott company has purchased from International its mills at Marinette (Wis.), Glens Falls (N. Y.), and Fort Edward (N. Y.).

◆

▶▶▶ THE RATIO of United States paper production to mill capacity for the week ending May 26, 1945, as reported by the American Paper and Pulp Association, was 92.0 per cent compared with 92.5 per cent for the preceding week and 90.0 per cent for the corresponding week a year ago. Paperboard production was 97 per cent for the current week compared with 97 per cent for the preceding week, and 96 per cent for the corresponding week a year ago.

◆

▶▶▶ UNDAUNTED BY three disasters, John E. Johnston has announced he plans to rebuild the Johnston Pulp Corporation mill at Port Leyden, New York. For the third time, the mill was recently destroyed. While being built in 1896, the mill burned on July 4. In December, 1901, the building was washed away by a flood. The mill was built by the late Dr. W. H. Johnston, father of the present owner.



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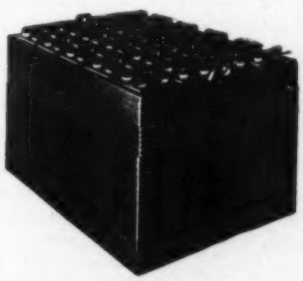

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WPB ANNOUNCES REVISIONS IN PULP ALLOCATION ORDERS

Two major provisions involving the preferred status of deliveries and uses of wood pulp in the event of pulp deficiencies have been made in Direction 1 to Conservation Order M-93, as announced May 23 by the Pulp Allocation Office of WPB.

As in the past, pulp producers are required to complete deliveries to consumers other than themselves, in the event of a deficiency in their pulp supply, but the list of paper and paperboard items to which consumers must give preference in the event of a shortage is drastically curtailed through the elimination of all grades except containerboard, pulp allocation.

It was explained this does not signify that all other items of paper and paperboard are necessarily less essential than containerboard. The Paper and Paperboard Division officials believe that other existing controls over the production and distribution of most essential items make it possible to give them preferential treatment without the necessity of maintaining them any longer on Direction 1.

The second major change in Direction 1 requires that multimill companies advise the Pulp Allocation Office of circumstances at any one mill that would make it impossible to complete either authorized deliveries or production of Direction 1 items in full, even after compliance with the direction. In such cases, WPB may require them to observe Direction 1 in whole or in part on a company-wide basis by adjusting their authorizations at other mills.

Officials stressed the fact that this change in Direction 1 in no way relieves mills of any obligations under Paper and Paperboard Conservation Order M-241. Moreover, in its relation to Order M-93, this direction applies only in the event of a wood pulp deficiency. Otherwise, mills must observe fully their form WPB-2973 authorizations for each grade of paper and paperboard.

▶▶▶ ESTABLISHMENT OF area dollar-and-cent ceiling prices for pulpwood in the western states is authorized by an order announced on May 31 by the Office of Price Administration. Ceiling prices of pulpwood in the western states have been at March, 1942 "freeze" levels since September 1, 1944. This order delegates authority to OPA regional administrators to fix ceiling prices for pulpwood sales in areas within their jurisdiction west of the 100th meridian, which extends north and south across the country bisecting North Dakota. This order is covered by Amendment 20 to Revised General Order No. 32, effective May 30.

▶▶▶ RESTRICTIONS on the manufacture of paper-mill machinery and parts, and wire cloth used in the production of pulp, paper, and paperboard, were removed by the WPB on May 14. General Limitation Order L-83, controlling the delivery and acceptance of paper-mill machinery, and Order L-209, controlling wire cloth for mill use, both have been revoked. These revocations, it is pointed out, do not affect any liabilities incurred under the orders.

▶▶▶ THE CONGRESSIONAL fight over the enactment of the Reciprocal Trade Agreement Act is going on in the Senate as this issue goes to press. Passed by the House, the Senate Finance Committee eliminated the provision giving the President the power to reduce duties 50 per cent. As this is written, it is expected the Senate will vote on the Bill within a few days.

WASTEPAPER COLLECTIONS STILL UNDER THE DEMAND

Wastepaper collections in April totaled approximately 618,000 tons, a decline of 22,000 tons from March, 1945, collections. These figures were supplied by the Conservation and Salvage Division of WPB. Consumption of wastepaper in April was about 591,000 tons. The inventory of wastepaper at the end of April was about 314,000 tons. These figures were supplied by the Conservation and Salvage Division of WPB.

W. Thomas Hoyt, director of the Conservation and Salvage Division of the WPB, has warned that while this represents the highest level of inventory this year, it does not constitute a safe level in view of the continuing demand for paper products for military and essential civilian needs.

▶▶▶ AFTER SERVING AS Industrial Specialist with the Tissue Paper Section of the WPB for the past three years, John Maloney will return to Green Bay (Wis.) on July 1 to resume his duties as sales manager of Hoberg Paper Mills. Mr. Maloney was appointed sales manager in 1944, having served as assistant sales manager since 1931.

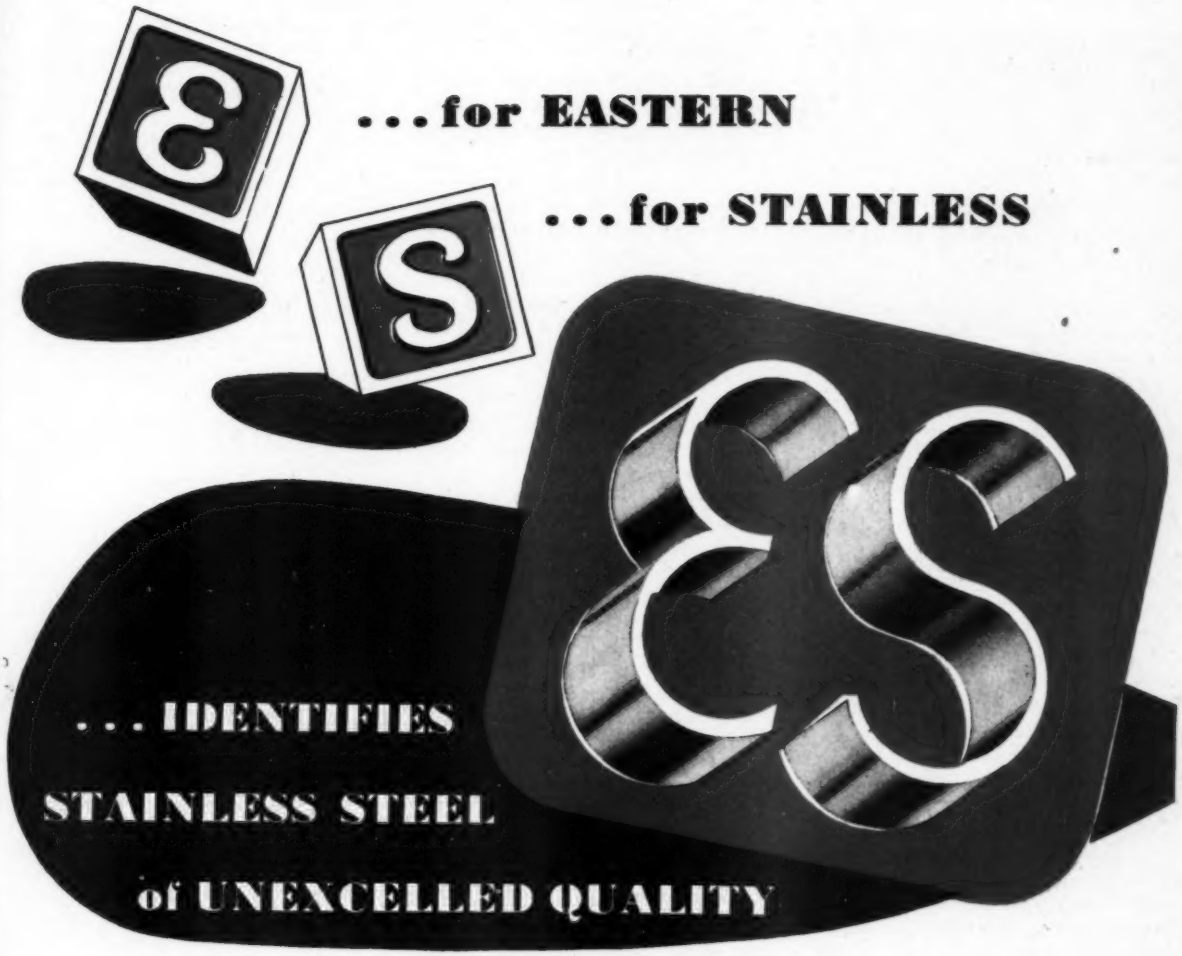
CUSTOMS TO RULE ON DUTY CLASSIFICATION OF IMPORTED KRAFT PAPER

The proper classification of imported paper partially made of kraft will soon come before the United States Customs Courts, according to Warren B. Bullock, manager of the Import Committee of the American Paper Industry. The paper has been classified by Customs officials as wrapping paper at 25 per cent, but is claimed by the importer in his appeal to the Customs Court to be properly dutiable as kraft wrapping paper at 20 per cent. Part of the shipment 75 per cent sulphate, 15 per cent sulphite and the balance groundwood. The balance of the shipment is 50 per cent sulphate, 30 per cent sulphite and 20 per cent groundwood.

The Customs officials base their classification on the fact that the Swedish and Finnish Reciprocal Trade Agreements reduced the rate on "sulphate wrapping paper" to 20 per cent, but that on other wrapping paper to only 25 per cent. The duty rate in the Tariff Act of 1930 provided a rate on 30 per cent on all wrapping paper.

▶▶▶ AN IMPORTANT PROBLEM for the paper industry is the Swedish pulp situation. Swedish shippers have asked the Office of Price Administration to permit sales of pulp for American consumption at a material increase over present ceiling prices, taking the position that with present freight rates it is impossible to ship any of the huge stocks now warehoused in Sweden without loss. The prblem may be met by some reduction in ocean freight rates to relieve the situation to the extent previously asked in the form of higher ceilings by representatives of the Swedish interests.

▶▶▶ V-E DAY already has resulted in some moderate relaxation of War Production Board control and limitation orders, and further relaxation is expected as time goes on, though officials indicate that the paper shortage is likely to continue unabated through the third quarter of this year. Because of this shortage many control orders are likely to remain in effect



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until the war against Japan is much further advanced. Resources of materials, manpower and facilities will only become available for civilian production when military contracts are actually cut back.

FINANCIAL

Maintained strength in the securities markets following V-E Day resulted in many higher prices for industrial stocks, but paper mill securities remained about the levels of the previous month.

Albermarle Paper Manufacturing Company—Net income for the year to March 31 was $125,636 as against $134,787 for the same quarter in 1944.

American Boxboard Company—A new issue of $1,280,000 of 20-year 4½ debentures will be used to retire all outstanding 7 per cent indebtedness of $744,230 and the balance for plant improvements.

American Paper Goods Company—Net income was $134,586 in 1944 as against $171,088 in 1943.

American Writing Paper Corporation—Income for the March quarter was $50,335 as compared with $56,790 for the same quarter in 1944.

Certain-teed Products Corporation—Net income for the March quarter was $222,093 as compared with $195,297 for the same quarter in 1944. During the quarter the company redeemed from its own funds $1,000,000 of its 5½ per cent debentures and refunded the entire balance of $4,000,000 through the issuance of a like amount of 3½ per cent sinking fund debentures. A year ago the company was paying 5½ per cent interest on $7,1000,000 and the debt is now reduced to 3½ per cent on $4,000,000.

Container Corporation—Net profit for the March quarter was $479,045 as against $569,517 for the same 1944 quarter.

Continental Diamond Fibre Company—Net profit for the March quarter was $106,593 as compared with $83,878 last year.

Crown Zellerbach Corporation—The last of the company's bank loans, amounting to $1,500,000, has been paid, freeing the company from debt for the first time since the merger with the Crown Willamette Paper Company in 1928. Since 1931, the company has liquidated bond and loan debts totaling $40,500,000.

Eastern Corporation—First quarter earnings were $11,362 as against $110,070 for the same quarter in 1944.

Gaylord Container Corporation—Net income for the March quarter was $262,364 as against $268,799 for the same quarter in 1944.

Great Northern Paper Company—Net income for the March quarter was $269,663 as against $448,426 for the same quarter in 1944.

Hinde & Dauch Paper Company—Net profit for the March quarter was $306,494 as against $323,459 for the same period in 1944. Holders of $5 convertible preferred stock may tender these shares in exchange for a new $4 convertible preferred stock, which in turn may be exchanged for three and a half shares of common stock for each share of preferred.

Hummel-Ross Fibre Corporation—Net income for twelve weeks ending March 24 was $50,101 as against $58,137 for the comparable period in 1944.

International Paper Company—Net earnings for the March quarter were $2,110,243 as against $2,116,706 for the comparable quarter in 1944.

Minnesota & Ontario Paper Company—Net profit for the March quarter was $479,045 as against $569,517 for the same 1944 quarter.

National Container Corporation—Net income for the March quarter was $303,426 as against $258,737 for the same 1944 quarter.

Oxford Paper Company—Net profit for first quarter of 1945 was $213,711 as against $210,392 for the same quarter in 1944.

Paraffine Companies—Net profit for nine months ending March 31 was $1,500,264 as against $1,417,047 in the comparable period of the preceding fiscal year. In the March quarter, profit was $479,483 as against $471,264 for the same quarter in 1944.

Puget Sound Pulp & Timber Company—Net profit for the March quarter was $295,295 as against $133,245 in the same quarter of 1944.

Rayonier, Inc.—A 1 to 15-year serial loan of $9,000,000 has been made to four banks and a life insurance company, the funds to be used to refund an existent loan and to meet obligations incurred through the recent purchase of extensive West Coast timber lands. Improvements in existing plants will require part of the funds.

Scott Paper Company—Net earnings for the March quarter were $315,498 as against $321,602 for the comparable quarter in 1944.

Union Bag & Paper Corporation—Net income for the year to March 31 was $538,637 as against $423,236 for the same quarter in 1944.

United Paperboard Company—Net income for nine months ending February 28 was $93,548 as against $53,852 for the comparable portion of the previous fiscal year.

New York Stock Exchange—Stocks

	Closing Prices May 25	Closing Prices April 25
A.P.W. Products ..	*4¾-5¼	*4½-4¾
Celotex	17	16
Same Preferred..	20¼	20¼
Certain-teed Prod..	11⅛	8½
Same Preferred.	*153½-154	*148½-150
Champion P&F Co.	34½	33½
Same Preferred..	113½	112
Container Corp.	28⅜	29¾
Cont. Diamond ...	12	11¾
Crown Zellerbach..	24⅞	22⅜
Same Preferred..	103⅜	*104-104½
Dixie Vortex	25	23
Same "A"	48	48
Robert Gair	5⅞	5⅞
Same Preferred..	17¼	17¼
Gaylord Container..	28¾	29
Same Preferred..	64	*60-60½
International Paper.	29¼	24¾
Same Preferred..	96⅜	89½
Kimberly-Clark	*47-47½	45
McAndrews & Forbes	*33-34	*32-33
Masonite	45½	45¼
Mead Corp.	15¾	13¾
Same Preferred..	102	*101-103
National Container.	16	15⅜
Paraffine Cos.....	65	63
Same Preferred..	109	109
Rayonier, Inc.	18⅛	18½
Same Preferred..	35½	37
Scott Paper	40	47½-47¾
Same 4½% Preferred	*110-113	*109½-112
Same 4% Preferred	*110½	*107¾-108¾
Sutherland Paper ..	33	33
Union Bag & Paper	16⅞	16⅜
U. S. Gypsum.....	88	84
Same Preferred..	*192-195	190
West Va. P&P Co..	25½	25
Same Preferred.	*109-110½	114¼-113

New York Stock Exchange—Bonds

Abitibi 5%	107½	103⅞
Celotex 3¾%	....	105¾
Certain-teed 5½%.	....	....
Champion P&F Co.	....	....
Intl. Paper 5%....	....	104
Same 6%	....	110

New York Curb Exchange—Stocks

Am. Writing	9½	10¼
Great Northern ...	....	....
Hummel Ross	8⅜	7¼
Pug. Sound	16½	....
St. Regis	5¾	5¾
Taggart	....	....
United Wall Paper.	5	4⅜

*Closing Bid and Asked Prices

▶▶▶ IN A DECISION handed down May 28, the Federal District Court at Chicago upheld the basic "Scotch" Cellulose Tape Patent of Minnesota Mining and Manufacturing Company. The plaintiff charged the International Plastic Corporation of Chicago with infringement of its basic patent covering the transparent, pressure-sensitive tape originated by R. G. Drew and developed and marketed by 3-M Company for many years under the trade name "Scotch" Cellulose Tape.

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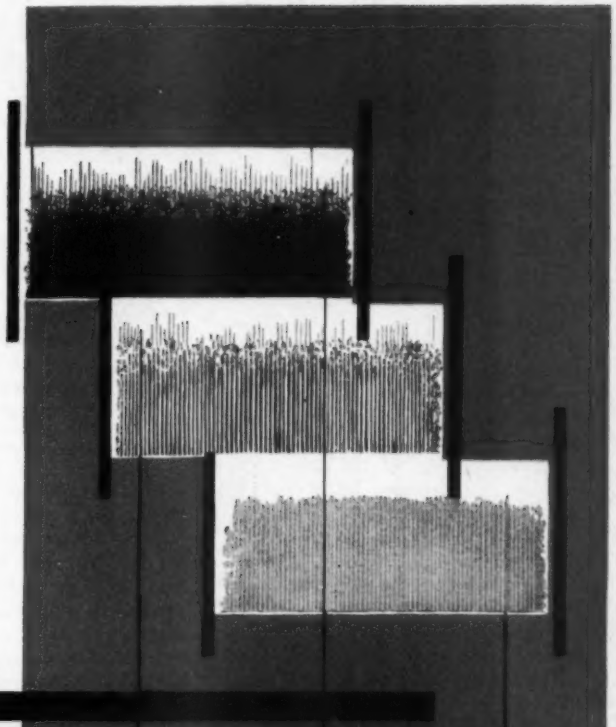
they "tend to their knitting" and make a better yarn!



A TYPICAL DOW BATTLE AGAINST MOLD

Manufacturers bothered by mold problems may learn a profitable lesson from textile weavers.

When fabric is woven, warp yarns must be stiff to enable the shuttle carrying the filler yarns to pass through without abrasion which causes wear and possible fracture of the yarn. To make it stiff, yarn is subjected to a process called "slashing" which consists of running it through a solution containing starch and oil. Naturally, the mixture is subject to mold and bacterial attack but, in addition, yarns sized with it may also be affected causing loss in tensile strength and possible discoloring due to mold stain.

Dow technicians experimented, tested, experimented more, tested more—and presented the answer . . . Dowicide. Today, this effective product protects slashing solutions . . . better fabrics woven by the textile industry are proof of another victory in the never-ending battle against mold.

Dow technicians and specific Dowicide products are ready to fight mold wherever it rears its head—in the paper, paint, lumber and other industries. If you have a mold problem, get in touch with us.

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CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

K-C CREPED WADDING MILL AT KAPUSKASING COMPLETED

According to a late announcement, the new creped wadding mill of Kimberly-Clark Corporation of Canada, located at Kapuskasing, Ontario, will start this month.

This new mill, which has been under construction for the past year, will produce creped wadding suitable for Kleenex, using pulp slushed to it from the pulp mill of the Spruce Falls Company. Creped wadding made at Kapuskasing will be shipped in the form of "hard rolls" to the converting plant of the International Cellucotton Products Company at Niagara Falls, Ontario, for conversion into Kleenex for the Canadian and overseas markets.

The management of the new enterprise has been handled by Wesley F. Cook, who was formerly a member of the industrial relations staff of the parent company at Neenah, Wisconsin. Mr. Cook has been in Kapuskasing since last fall. Several members of the K-C operating staff will help start up the new equipment. Among these are:

W. H. Swanson, staff supt, of pulp mills

C. W. Nelson, chief engineer

Forrest Werling, asst. staff supt. creped wadding

J. T. Whelan, asst. chief engineer

Horace DuBois, asst. staff supt. pulp department

R. A. Moravek, division engineer, creped wadding

◆

SMALL BUSINESSES TO FEEL THE SHORTAGE OF TECHNICAL PERSONNEL

Postwar expansion of industrial research by small companies, which are planning a large increase in such activities, will be limited by the scarcity of scientific and technical men, R. J. Dearborn, president of Texaco Development Corporation and chairman of the Patents Committee of the National Association of Manufacturers declared today.

Creation of many postwar jobs will depend upon the invention of new types of consumer goods, and for this purpose many companies, especially small ones, are planning to augment their research staffs, Mr. Dearborn said. The greatest increase is contemplated in concerns employing less than 50 persons but, it was pointed out, these companies probably are not aware of the shortage in technical personnel.

"One of the most serious problems of industry is the deficit in fully trained young professional men for postwar employment," stated Mr. Dearborn. "This country is faced with a period during which the demands of war-stimulated technology will not be met by an adequate supply of scientists and engineers. As research is the backbone of industrial progress and creation of jobs in the postwar era, the lack of a sufficient number of well-trained scientists will have a profound effect on invention and plans of corporations to provide for many new products in the period just ahead of us."

The principal factor in the prospective shortage of professional men available to industry is that the war has prevented the normal flow of trained young men from the colleges. Another reason for the deficit, Mr. Dearborn stated, is that many men are in the services or in war jobs, a great number of whom will find it difficult to resume their old work due to disuse of their technical abilities. The combination of combat losses, retirement and diversion to other activities will add several thousand to the shortage of trained men.

Training of scientists in the college has almost come to a standstill, it was pointed out, and it has been estimated that the normal flow of technical graduates cannot be resumed until 1950.

Another factor which will affect industry is that the Government probably will intensify its research activities and be a competitor, for the first time, of industry for scientific personnel, it was stated. Research expenditures, both public and private, in the United States before the war were estimated at $250,000,000 a year, $50,000,000 of which was spent by the Government. More than $600,000 now is being spent yearly by more than 40 Government agencies and bureaus for research in their own laboratories or through contracts with private organizations and educational institutions.

In addition, there will be a great demand for United States technical personnel abroad due to the tremendous reconstruction work which will be needed and also from the colleges for teachers, the NAM committee emphasized.

"Our scientific and technical personnel are among our most prized resources," Mr. Dearborn said. "In planning for the great expansion expected in the postwar period and to provide for maximum employment, industry should give this problem careful attention. Also, in order that the creation of the greatest amount of new products is made possible with the technical skill available, it is essential that destructive changes in the patent system be avoided and that only constructive changes be made so that incentive to conquer new frontiers shall not be destroyed."

◆

LITHOGRAPHIC TECH. FOUND. TO WORK MORE CLOSELY WITH ILLINOIS INSTITUTE OF TECH.

At the annual meeting of the Board of Directors of the Lithographic Technical Foundation, held at the Edgewater Beach Hotel in Chicago on May 10, a decision was made for further consolidation and concentration of lithographic research at Armour Research Foundation of Illinois Institute of Technology in Chicago.

Following an agreement consummated in the late summer of 1944, a number of lithographic research projects on the Lithographic Technical Foundation program have been active in the Armour Research Foundation laboratories and have shown favorable progress. At the same time, other purely lithographic projects have continued at the LTF's own laboratory at the University of Cincinnati.

During the LTF meetings in Chicago in early May, members of the

A Message From Your Government

That the war with Japan may be brought to an early Victory, the Government needs and asks its citizens to:

1) Plan to spend your vacation at home and leave railroads free for increasing furlough travel and redeployment of men to the Pacific.

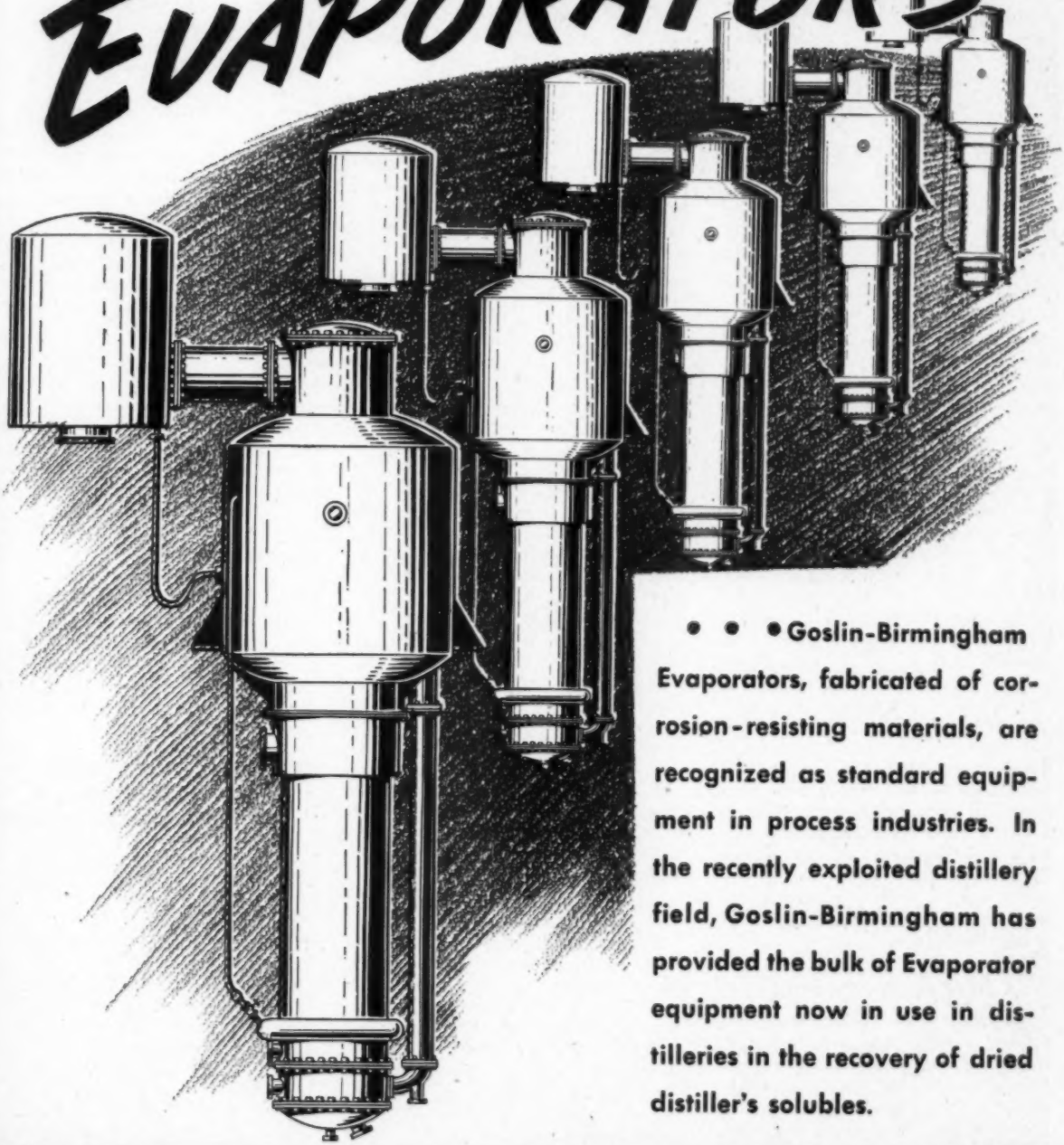
2) Join the Cadet Nurse Corps and help meet your country's wartime nursing needs. Sixty thousand high school graduates between 17 and 35 are needed. Ask your local hospital about this free training.

3) Salvage wastepaper scraps as well as newspapers and magazines. The paper shortage remains critical.

4) Serve in your community as a price panel assistant. Volunteers are urgently needed in the job of holding prices down and preventing inflation. See your local rationing board.

5) Make sure of the biggest possible harvest from your Victory garden, and store and can for your family's needs. Civilian supplies of canned vegetables will be lower next winter.

EVAPORATORS



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Board and of the Research Committee representing the industry further studied Armour Research Foundation facilities and inspected property known as the Glessner House, located at 18th Street and Prairie Avenue and which is a part of Illinois Tech research and educational properties.

Consideration was given by the Board to concentrating LTF research under one roof at the Glessner House and favorable action has been taken to effect the move as soon as is practicable. It is anticipated that the LTF will move its research facilities and equipment to Glessner House about August first of this year.

Realizing the expectation of the lithographic industry for accelerated research results in the anticipation of an early period of expansion, provisions were also made by the Board for an increased research budget for 1945.

Robert F. Reed, research director of the LTF, will continue in that capacity and completion of projects now active at the University of Cincinnati will be expedited there this year.

It is anticipated that the new arrangement of consolidation will effect a definite economy of research expenditures for the LTF, provide better control of the active research projects and accelerate the results on urgent problems that confront the industry.

The LTF also has announced the purchase of a property at 131 East 39th Street, New York City, which will serve as administration and educational department headquarters of the Foundation in New York. This purchase has been made possible through a special fund contributed by representative lithographers and suppliers in all parts of the country and is entirely separate from the regular endowment and annual operating funds of the Foundation.

◆

A NEW SULPHITE PROCESS

American paper mills, using the sulphite pulping process to manufacture paper pulp, lose 10,000 tons per day of recoverable lignins, carbohydrates and the chemicals employed in the extraction or cooking operation, L. S. Wilcoxson, executive assistant, The Babcock and Wilcox Company, told the Main-New Hampshire Group of the Technical Association of the Pulp and Paper Industry in a meeting at the Hotel Elmwood, Waterville (Me.) on May 11. In addition, this "waste," which is pumped out from the paper mills in liquid form to adjoining streams, pollutes the waters, killing off fish and plant life.

An answer to the problem may be found in a change in the chemical used in the acid process from a calcium base to a magnesium base, a process developed jointly by The Howard Smith Paper Mills, Montreal, Canada, and The Babcock and Wilcox Company, New York; and independently by the Weyerhaeuser Timber Company, Longview, Washington.

"When magnesium bisulphite is employed as the cooking liquor, the no longer 'waste' liquor can be satisfactorily evaporated without scale formation, the chemicals recovered and recycled, and the heat from the combustion of the lignins and carbohydrates used for the efficient generation of steam," the speaker said.

Explaining that only a limited or small percentage of material now wasted can be used for commercially salable items such as vanillin, alcohol, yeast, oxalic acid, road binders, cements and lignin plastics, Mr. Wilcoxson said that there still remains the problem of the economic disposal of the balance. The waste products might be rendered non-toxic so that fish and marine vegetation would be uninjured, he continued, but this would constitute an additional cost against every ton of pulp produced by a mill, and therefore would be a definite economic disadvantage in the highly competitive pulp industry.

Following laboratory and experimental investigations, made by the Howard Smith Paper Mills and The Babcock and Wilcox Company, a semi-commercial pilot plant incorporating the magnesium base operation, was installed at the Cornwall, Ontario, Division of The Howard Smith Paper Mills Ltd. and operated for a sufficient period of time to prove conclusively the practicability and economics of the process. Further commercial installations of the process have been held up by the war.

Plans made to incorporate the results of the Howard Smith, Weyerhaeuser and Babcock and Wilcox research have been centered on the conversion of the Weyerhaeuser Sulphite Mill at Longviek, Washington, to magnesium base operation, but the entrace of this country into the war in December, 1941, prevented this program from being carried out. The plant will be constructed as soon as necessary critical materials are available.

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▶▶▶ A NEWSPRINT MILL for Mexico which will cost ten million dollars was announced recently by the Associated Press. The announcement stated that Mexican capitalists had completed plans for the plant which will be built at Atenquillo, state of Jalisco, in southwest Mexico, near the Pacific Ocean.

PHIL A. HOWARD ACQUIRES THE AMERICAN BOX MAKER

The Howard Publishing Company, Chicago, has just announced the purchase of all the capital stock of the Packaging Publications, Inc., Chicago, publishers of *The American Box Maker*.

Phil A. Howard, president of Howard Publishing Company, is well known throughout the paper industry. For twenty-five years he has published *The American Paper Merchant* and *The American Paper Converter*. He also has published the American Paper Convention Daily, issued during the convention of the national associations in New York.

◆

▶▶▶ THE PAYMENT OF the last $1,500,000 of its bank loans has made Crown Zellerbach Corporation, San Francisco, free of debt to banks for the first time since its merger with Crown Willamette Paper Company in 1928. Since 1931, Crown Zellerbach has liquidated a combined bond and loan debt which then totaled $40,-500,000.

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▶▶▶ THE CANADIAN PRESS recently published the announcement that Canadian International Paper Company recently acquired a half interest in the Canadian subsidiary of the Masonite Corporation.

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INCREASED PRODUCTION OF CANADIAN MILLS IS SEEN FOR 3RD QUARTER

A statement issued on May 20 by the Wartime Prices and Trade Board said it was now possible to confirm previously announced estimates that wood supplies will permit an over-all increase of 5 to 6 per cent in the production of Canadian pulp and paper mills beginning with the third quarter of this year. The third quarter allocation of newsprint for the United States will be at the rate of 215,000 tons per month of 32-pound paper, a total of 645,000 for the quarter; and the U. S. allocation of pulp will be 270,000 tons for the quarter. The newsprint allocation for Canadian consumption will be similarly increased.

Commenting on the over-all paper and paperboard supply for Canadian consumption, the statement said that while the Board has been relaxing controls wherever possible, there can be little immediate change from the current situation, with the exception of newsprint, owing to the shortage of wastepaper and the needs of the Pacific war.

THE COLOR PROBLEM GROWS

Often the solution of one problem means the creation of another.

For example, the introduction of new or improved processes may create color problems for the dyer. Add to this the lower grade of materials available today, and these problems may swell to serious proportions.

When such problems arise, the Technical Staff of Du Pont's Laboratories stands ready to place its fund of knowledge and experience at your disposal, E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Delaware.

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Job Evaluation — a Science

Job evaluation, the science of measuring the relative importance of jobs in industry, must play an essential role in solving the problem of postwar industrial adjustments, Willis M. Fanning declared recently at a meeting of the Pawtucket Business Men's Association and Chamber of Commerce. Mr. Fanning is vice president of Albert Ramond and Associates, industrial engineers.

"With the reconversion of industry to peacetime production," he said, "it will be necessary for industry to re-evaluate jobs to determine whether one is worth more or less than another."

It may even be necessary, he added, to re-appraise the job of a worker who will produce the same tools and handle the same machine in peacetime as he did during the war.

Job evaluation, he said, does not fix absolute wage rates, except when the general wage level for the occupation has already been set elsewhere. Usually each job is evaluated according to the answers to these questions:

1) What skills, knowledge and experience are necessary for the job?

2) What is the relative importance of each factor to the job as a whole?

3) What is the relative importance of the job as a whole, in relation to other jobs?

Mr. Fanning emphasized the need for holding labor's continued support toward the practice of job evaluation, particularly at a time when its application might result in a lower occupational rating for some jobs, calling for a corresponding reduction in the wage rate.

During the war, he pointed out, both labor and management have shown a favorable attitude toward job evaluation. Its increased use in recent years, he said, "has taken place at a time when the wage level was almost continuously going up.

"This contributed to its ready acceptance by workers, who associated it with wage increases. Also, since the start of wage stabilization, both employes and employers have used job evaluation as one of the few procedures acceptable for justification of upward wage adjustments."

He warned, however, that it is an "open question" whether this favorable attitude will continue in the face of possibly falling wage levels. In such a case, he said, job evaluation would certainly be subjected "to critical scrutiny far beyond current experience."

"The readiness of labor to accept it as a legitimate basis for such downward rate adjustment," he continued, "is yet to be generally proven—and the real test of the soundness and solidity of any job evaluation will be made when those downward adjustments have to be made."

To insure the success of job evaluation programs, Mr. Fanning insisted, active labor participation must be secured.

"Establishment of proper wage differentials among the various jobs in a plan," he said, "is one of the most important requisites of sound industrial relations. Under present conditions, it is unwise to try to force down workers' throats a job evaluation schedule that they have not helped to make."

The fact that his company, has successfully applied job evaluation in plants throughout the country, he concluded, is evidence that it can be done.

◆

PATENT APPLICATIONS SHOW AN UPWARD TREND

A marked increase in the number of applications for patents now being filed in the Patent Office indicates that American inventors have faith in the future of the United States and are endeavoring to create many new products for the postwar era, R. J. Dearborn, chairman of the Patents Committee of the National Association of Manufacturers, announced recently.

Patent Office statistics show that applicant for patents, for the first four months of 1945 were about 20 per cent above the similar period of last year, and nearly 40 per cent higher than that period in 1943. The low in applications for about 30 years came in 1943, when 45,535 were received. Last year the number rose to 54,232, and now is running at the rate of about 62,000 a year.

"The rise in patent applications shows that American inventors are confident that patent protection will be continued," said Mr. Dearborn. "The fundamentals of the patent system should be preserved, as patents mean jobs. The incentive to invent must not be curbed if maximum employment is to be provided in the important postwar period. It is a healthy sign that both industry and individuals now are thinking in terms of new products for peacetime production."

Another indication of the tremendous interest in postwar business is the fact that the Patent Office is being deluged with requests for printed copies of patents already sisued.

While applications for patents are increasing rapidly, it was pointed out that it will be some time before there will be a gain in the number of patents granted because, due to war conditions, the Patent Office staff is not large enough to cope with the increase in work. Issuance of patents in 1944 totaled 28,073, the lowest since 1902, and 45 per cent below the peak reached in 1932. The slump has been attributed partly to the depression, partly to court decisions unfavorable to patent holders and partly to the war.

"With the return to peactime economy, the rate of filing applications for patents will be greatly accelerated," Mr. Dearborn declared. "In order to cope with this increase, the staff of the Patent Office must be enlarged so that investigations may be made as quickly as possible and thoroughly. The work of the office now is falling behind as the number of examiners is two-thirds of normal on account of the war. Since examiners, except beginners, must have degrees in both engineering and law, it may be difficult to find competent personnel unless the government raises salaries. It is vitally important that there should be little delay in the granting of patents in order that this country go forward and there be the maximum number of jobs in the period ahead of us."

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▶▶▶ THE SPRUCE SAWFLY PEST now exists in epidemic proportions over an area of 120,000 square miles in Quebec and Ontario, according to a survey released by officials of the Quebec Department of Lands and Forests. Quebec has, therefore, decided to follow the example of Ontario and use airplanes to spray the infested areas with generous quantities of the new and powerful D.D.T. insecticide in an effort to save the pine and spruce which the pest is destroying.

◆

▶▶▶ AN IMPROVEMENT and expansion program at the Shelton (Wash.) plant of Rayonier, Inc., has been approved by the War Production Board. The amount approved, $330,000, will make possible the renovation of present equipment and the installation of some new machinery in this pulp mill.

◆

▶▶▶ CRUDE SULPHATE turpentine is now being produced at the plant of the Minnesota and Ontario Paper Company, International Falls, Minnesota. Production at the present time is about one tank car per month. The installation of special condensing equipment was completed recently to recover this turpentine. It is accumu-

lated in a large storage tank from which it is pumped to railroad tank cars. This crude sulphate turpentine is shipped to paint manufacturers who refine it and use it as other commercial turpentine in their products.

◆

▶▶▶ MARKING A FURTHER stage in the $1,000,000 expansion plans of the Westminster Paper Company, New Westminster, British Columbia, the firm has now taken over the site occupied by the Fraser River Pile Driving Company, immediately west of the present paper plant. The company also has acquired an adjacent site for the construction of administrative offices.

◆

FOREST VILLAGE PROJECT PART OF POSTWAR PLANNING

A postwar plan, which is still in the idea stage, is being followed with considerable interest to pulp manufacturers in Ontario. The Department of Planning and Development will experiment, if plans work out, with what is known as the Nipigon Forest Village project. The site of the proposed experimental village is on the South shore of Lake Nipigon in northwestern Ontario.

The success of the project depends largely on what geologists and other scientific experts find upon investigation of the area. Studies are being made of the types of wood, their rates of growth, size of the annual crop, etc. The soil and wild life also must be studied because the idea of the experimental village is to settle about 50 families, preferably war veterans, chosen for their adaptability to forest life. Pulpwood cutting, of course, would be the principal form of livelihood.

◆

▶▶▶ CANADA'S SHORTAGE of wastepaper did not end with the defeat of Germany. This statement was made by Canadian War Services Minister McCann, who has appealed to voluntary salvage committee members across the Dominion to keep up their work in supplying paper mills with all the wastepaper they can get.

◆

SUTHERLAND PAPER COMPANY WAREHOUSE DAMAGED BY FIRE

On the evening of May 23, a fire at the North Pitcher Street warehouse of the Sutherland Paper Company, Kalamazoo, Michigan, resulted in damage to the building and contents amounting to approximately $50,000. One fireman was injured and four others were injured while fighting the blaze. It is believed that spontaneous combustion in the paper bales was the cause of the fire.

Damage to the machinery was not considered a major part of the loss. The warehouse where the fire occurred had been rebuilt and remodeled following a fire which occurred in August of 1942.

◆

NEW FINANCING PLAN IS ANNOUNCED BY M & O

At the annual meeting of the shareholders of Minnesota and Ontario Paper Company, held in Minneapolis on May 28, approval was given to a proposal to refund the balance of approximately $6,000,000 of the company's 5 per cent income bonds and to authorize a new mortgage and the issuance of $6,000,000 of new mortgage bonds.

The new bonds will bear interest at approximately 3 per cent with maturities extending over fifteen years. The plan likewise reduces annual interest charges by approximately $120,000 and reduces annual bond retirements which have averaged $1,450,000 per year for the preceding four years to an average of $400,000 for the next 15 years.

The purpose of the refinancing plan is to make available funds for other corporate purposes essential to the welfare of the company, particularly in respect to necessary improvements and expansion of properties and anticipated postwar requirements.

◆

ROBERT GAIR COMPANY ANNOUNCES ACQUISITION OF A NEW FACTORY SITE

The acquisition of a new factory site in Binghamton, New York, has been announced by Robert Gair Company, Inc., New York. The property consists of approximately 4½ acres, is about 400 feet deep.

The company plans to erect on this site a large new plant, equipped in the most modern manner, for the manufacture of quality corrugated products. When completed, it is expected the plant will employ from 150 to 200.

◆

▶▶▶ TIMBER AND LAND holdings of the logging firm of LaPlant, Morgan, and Gates have been purchased by the Coos Bay Pulp Corporation, of Empire, Oregon. The holdings include 25,000,000 feet of mixed timber on approximately 500 acres of land located near Bellingham (Wash.)

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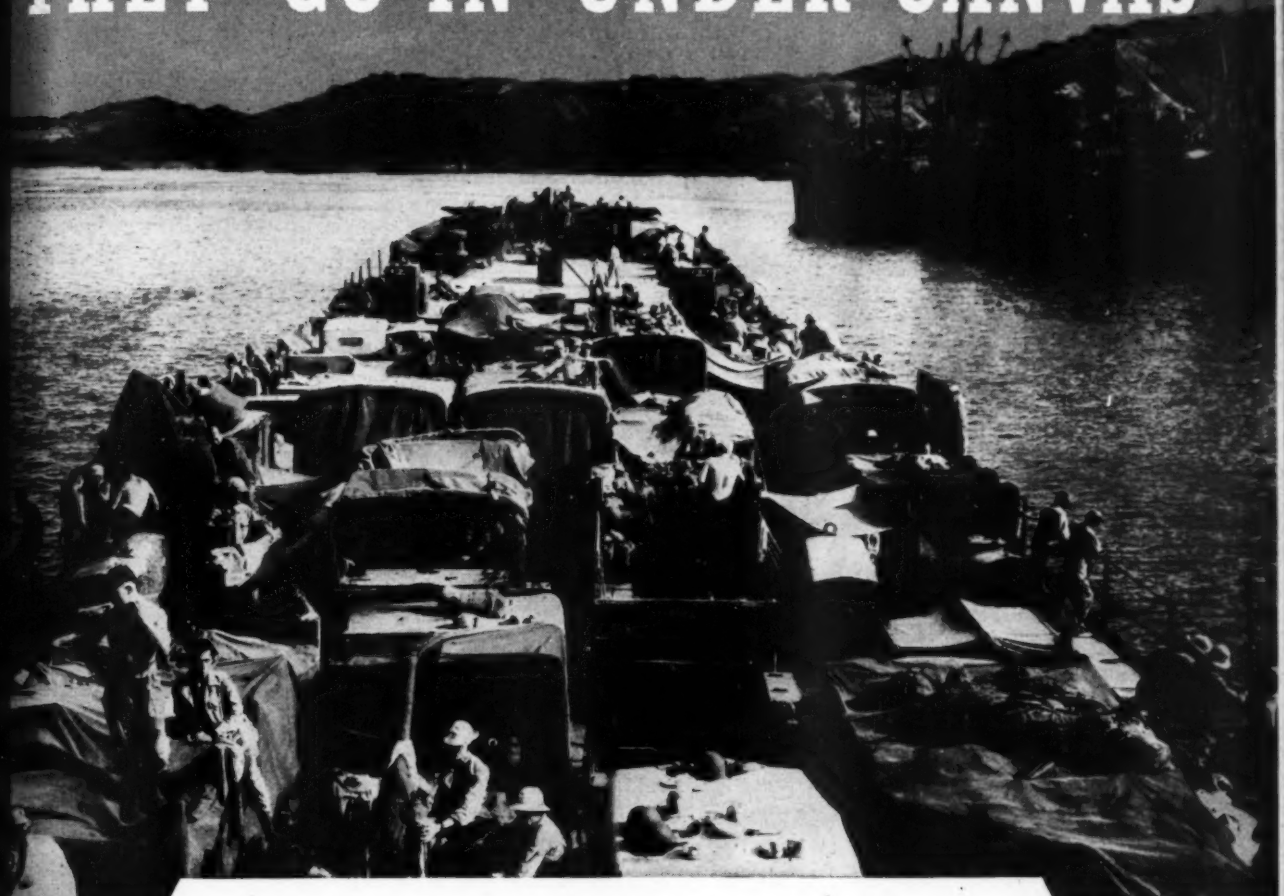

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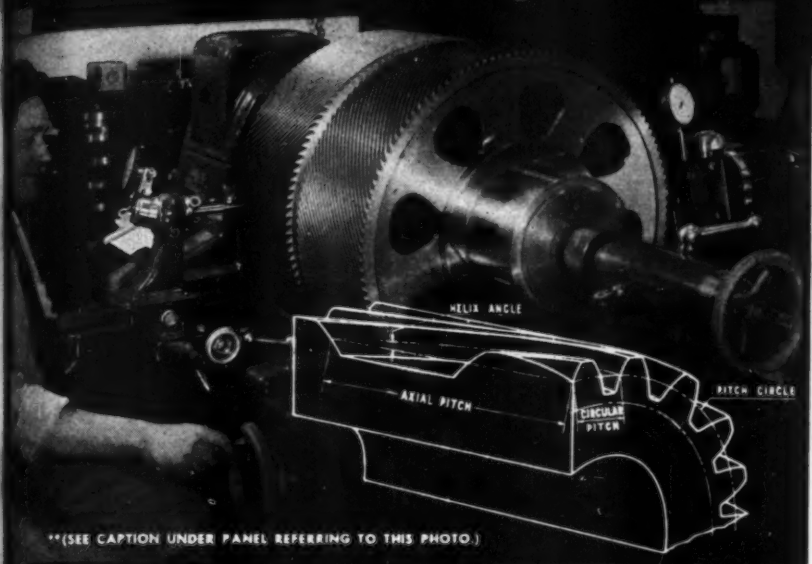

**(SEE CAPTION UNDER PANEL REFERRING TO THIS PHOTO.)

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When plastics from resins and magnesium from sea water were only a gleam in the eye of scientists, Falk research was "a going concern."

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1896 ... The first Falk research was initiated 49 years ago in a Chemical Laboratory devoted to the testing of "ingredients of materials" used in the manufacture of Falk products.

1900 ... Metallurgical research was made a part of the Chemical Laboratory so that "Falk's foundry work included not only its art but also its science."

1905 ... An old Falk catalog refers to Falk research and describes "our own Chemical and Testing Laboratories which enable us to secure a complete record—microscopic, physical, and chemical—of all material used in our furnaces and of the resultant castings."

1906 ... Harold S. Falk, now President, graduated from the University of Wisconsin, the first student of that school to major in metallurgy, stimulating further interest in the importance of research in the field of metal-working.

1910 ... Falk designed and built its own gear hobbing machine in order to manufacture an improved type of herringbone gear which Falk research had proved feasible.

1927 ... An extensive research program of gear performance and capacities was inaugurated. The findings, later presented in an engineering paper, were subsequently found to possess widespread significance.

1929 ... The first research program on the Falk All-Steel Flexible Coupling was started, resulting in improved performance and longer life.

1934 ... The research on gear performance and capacities, started in 1927, was brought to a conclusion and culminated in the Schmitter Rational Gear Formula, now accepted by the industry as the basis for gear design and rating.

1935 ... Further research on Falk Couplings resulted in a coupling that is unique both from the design and long, trouble-free service standpoint.

1938 ... Research was carried on which led to the famous Falk Marine Reverse Drive used in army cargo boats, tugs, navy barges, and exclusively in LST's.

TODAY ... Gruelling tests in which couplings are being operated under severe misalignment, and gear tests at speed step-ups as high as 30,000 revolutions per minute are now in progress.

** Falk technicians are never satisfied that they have reached the ultimate. Here, in this photograph, the helical lead of a turbine reduction gear is being checked on a lead checking machine.

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FOR THE PAPER INDUSTRY

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT — CBS

Editorial

The Paper Industry Status

▶▶▶ IT IS A MONTH since V-E Day. The paper trade is agog with rumors of exports of Swedish pulp to the United States—and what a relief it would be in our tight paper situation.

So far as we can glean, there have been eight cargoes shipped from Sweden; four to England; one to Portugal and three to South America; none to the United States. Sweden desires to ship pulp to America. America wants and needs the pulp. But there are OPA and other deterrent factors. However, if we can satisfy the Swedish producers on price and get all they have to sell (which has been reported as 800,000 tons) it would not help us a great deal. If we get half of that amount—say, 400,000 tons—during the balance of this year, it would be equivalent to about a ten-day supply.

Now, let's look at the record: In 1937, Sweden's peak year of operations, she produced 3,766,559 tons of all grades, but she imported 12,477 tons, making a total of 3,779,036 tons. From this total, she exported 2,813,616 tons to all countries, leaving her 965,420 tons for consumption. Of the 2,813,616 total exports, the United States got 1,130,075 tons that year, which was Sweden's peak year of exports to the United States.

The following three years, Sweden sent the United States: 807,129 tons in 1938; 873,359 tons in 1939; 279,022 tons in 1940. Since 1940, Sweden has sent us nothing.

In 1937, the United States took 40 per cent of Sweden's export pulp. Forty other countries took 60 per cent.

The United States needs that 40 per cent now and as much more of the 60 per cent as we can get. But we can't get it because Sweden is the only paper-producing country in Europe which has not been invaded except England, and naturally, the forty other countries, who have had none of Sweden's pulp for five years, need all that they can get for their reconstruction. However, we shall get some. Every ton, which we can import from any other country, eases the pull upon our own forests and overworked capacity producing equipment.

There are only three important pulp and paper-producing countries emerging from the war, with their production processes intact to whom the rest of the world must turn for their supplies of pulp and paper in 1945—the United States, Canada and Sweden. Giving each its peak production tonnage:

	Tons
United States	17,272,914
Canada (1937)	4,485,445
Sweden (1937) ...	3,766,559
Total production.	25,524,918

In 1937, the world's production was 31,863,107 tons. Here is an indicated deficit of 6,338,189 tons. It would take one hundred mills making two hundred tons a day for 310 days in the year, requiring an investment of at least $500,000,000 to supply that deficit tonnage.

That's for the world's situation.

In the United States, the greatest producer, as well as the greatest consumer, of pulp and paper products on the earth, there has been no increased tonnage since the war began. In 1937, our production was 12,837,003 tons, which was 82 per cent of the then capacity. In 1941, our production jumped to 17,272,914 tons, our consumption to 19,761,239 tons.

There has been no increase in the past four and one-half years. That we reached capacity is shown by the fact that for the years 1941, 1942, 1943, and 1944, the average was 17,143,838 tons.

Thus, both production and consumption have been frozen—they are static and will remain so until government controls are released. However, a potential demand has been accumulating in this country.

Over a period of the past forty-two years—from 1900 to 1941 inclusive—the consumption of paper has increased 420 per cent, which is at the rate of 10 per cent per annum. That trend is still operating. It has been developing for forty-two years and hasn't quit simply because Washington does not recognize it. Prorating that trend to the past four and one-half years and adding it to the peak production of 1941 gives us an accumulated potential demand of 25,045,715 tons for 1945.

But our United States production has not gone above the 17,272,914 tons in 1941, yet our 1945 potential demand calls for 7,772,801 tons more. Where is it coming from?

To produce this 7,772,801 tons will take 125 mills making two hundred tons a day for a 310-day year, requiring an investment of at least $625,000,000. Do not jump to the conclusion that this method of calculation is overestimation or fantastic figuring. We will cite you a forecast which was an underestimation and let you draw your own conclusion.

On July 29, 1924, the United States Department of Agriculture issued Department Bulletin No. 1241, captioned "How the United States can meet its present and future Pulpwood Requirements" by Earle H. Clapp and Chas. W. Boyce of the Forest Service, also stating in a subcaption "Prepared in co-operation with the American Paper and Pulp Association and the Committee on Perpetuation of the Pulp and Paper Industry in the United States." We quote from page 27, first paragraph, under caption—"Probable Future Paper Requirements":

"A curve indicating trends in paper consumption since 1810 is extended as far as 1950 in Fig. 21" . . . Then, follows this statement:

"The enormous present consumption of paper (1922) makes it difficult to accept consumption in 1950 as great as 13½ million tons, the volume indicated in the curve."

Well, in 1939, just fifteen years later, with eleven years to go to 1950, the production was 13,509,642 tons and the consumption was 15,946,515 tons—1,466,515 tons more than they found "difficulty in accepting" for 1950 consumption.

A perfectly understandable miscalculation, because at that time they did not have the fact, developed over a forty-two year period, that American consumption of paper increases six times faster than the increase in population. In the light of present day facts, if we were to project our consumption to 1950, we would plot a curve showing the consumption as 35,826,000 tons at that date.

In conclusion, we will settle for 25,000,000 tons of potential consumption in this country for 1945.

Current Thought

WILLIAM SIBLEY

A Needed Review and Revival

THE FLAG SPEAKS

▶▶▶ I AM WHATEVER YOU MAKE ME—nothing more. But always I am all that you hope to be and have the courage to try for. I am song and fear, struggle and panic and enobling hope. I am the day's work of the weakest man, and the largest dream of the most daring. I am the Constitution and the courts, statutes and statute makers, soldier and dreadnaught, drayman and street sweep, cook, counselor and clerk. I am no more than what you believe me to be. —**Franklin K. Lane (1914).**

◆

What America Expects

Out of her abundant resources, out of her profound belief in the worth and dignity of every man, America offers you much.

What does America ask in return?

American expects Personal Character. America is not a separate entity, apart and distinct from its people. America is the people. America is all-of-US, incorporated. Therefore, whether America is strong or weak, virtuous or mean, valiant or faltering, depends upon the character of the citizens who compose it.

America expects unity. It expects you to think and act in terms of the whole nation and not of any one State or section; of the whole people and not of groups or creeds or classes.

America expects knowledge — knowledge of our history, knowledge of our literature, knowledge of our ideals.

America expects faith—faith in its form of government and faith in your own capacity to be part of that Government.

America expects effort. In America the key to opportunity bears the label "work."

And, above all, America expects Patriotism. Patriotism in word and thought and deed. It expects you to so live that America will be a better place because you are a part of it.—**Raymond Pitcairn,** Excerpts from *Today We Are Americans All.*

PLEDGE TO THE FLAG

I pledge allegiance to the flag of the United States of America and to the Republic for which it stands. One Nation indivisible, with liberty and justice for all.

THINGS THAT MAKE AMERICA GREAT

It is a Government which holds that Government; is made for man and not for the Government, that Government is the servant of the people and not the master.

It is a Government in which office is not the special privilege of any hereditary class.

It is a Government in which the minority has the right to criticize and agitate for peaceful change. It is one in which the minority may grow into the majority.

It is a Government which, more than any other form, requires for its most effective operation the assumption by every citizen of his fair share of responsibility. Democracy requires individual morality, common sense and courage in its citizens.—**Howard E. Wilson, Nelle E. Bowman, Allen Y. King.** Excerpts from *This America —Our Land, Our People, Our Faith, Our Defense* (American Book Company, New York, 1942).

◆

The American's Creed

I believe in the United States of America as a government of the people, by the people, for the people, whose just powers are derived from the consent of the governed; a democracy in a republic; a sovereign nation of many sovereign States; a perfect Union, one and inseparable, established upon those principles of freedom, equality, justice and humanity for which American patriots sacrificed their lives and fortunes.

I therefore believe it is my duty to my country to live it, to support its Constitution, to obey its laws, to respect its flag, and to defend it against all enemies. — **William Tyler Page,** Clerk of the House of Representatives (1918).

◆

A CREDO

I myself am a part of democracy—I myself must accept responsibilities. Democracy is not merely a privilege to be enjoyed—it is a trust to keep and maintain . . . I am an American. I intend to remain an American. I will do my best to wipe from my heart hate, rancor and political prejudice. I will sustain my Government. And through good days or bad I will try to serve my country.—**Stephen Vincent Benét** (Copyright, 1942).

◆

Liberty

Freedom exists only where the people take care of the Government.—**Woodrow Wilson (1912).**

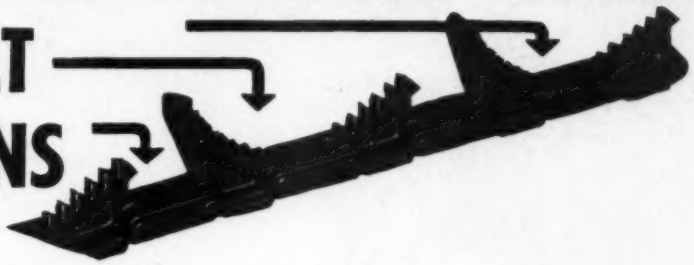
Is life so dear, or peace so sweet, as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take, but as for me, give me liberty or give me death!—**Patrick Henry,** in a speech before the Virginia Convention (1775).

I would rather be exposed to the inconveniences attending too much liberty than to those attending too small a degree of it.—**Thomas Jefferson (1791).**

They that can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety.—**Benjamin Franklin.**

I only regret that I have but one life to lose for my country.—**Nathan Hale** in a speech he made just before being hanged by the enemy as a spy (1776).

Continuous Slasher-Table Performance Assured with LINK-BELT SLASHER CHAINS



This Link-Belt 5-in. pitch SM-592 conveyor chain, for feeding logs broadside against the rotating circular saws that slash them into shorter lengths, has been especially designed for the rigorous service of pulpwood slasher tables. Throughout its length, each chain is assembled in this sequence—one plain outer link, one 5⅛" high H-1 malleable iron center link, one plain outer link, one 8¼" high H-2 malleable iron center link, thus forming log-supporting cradles on 20" centers. The plain outer links are made up with two high carbon steel side bars. Serrations on malleable center links help to hold the logs firmly in position. All joints are formed with heat treated, copper bearing steel rivets. Let experienced Link-Belt engineers help you solve your materials handling and power transmission problems. There is a Link-Belt chain for every service.

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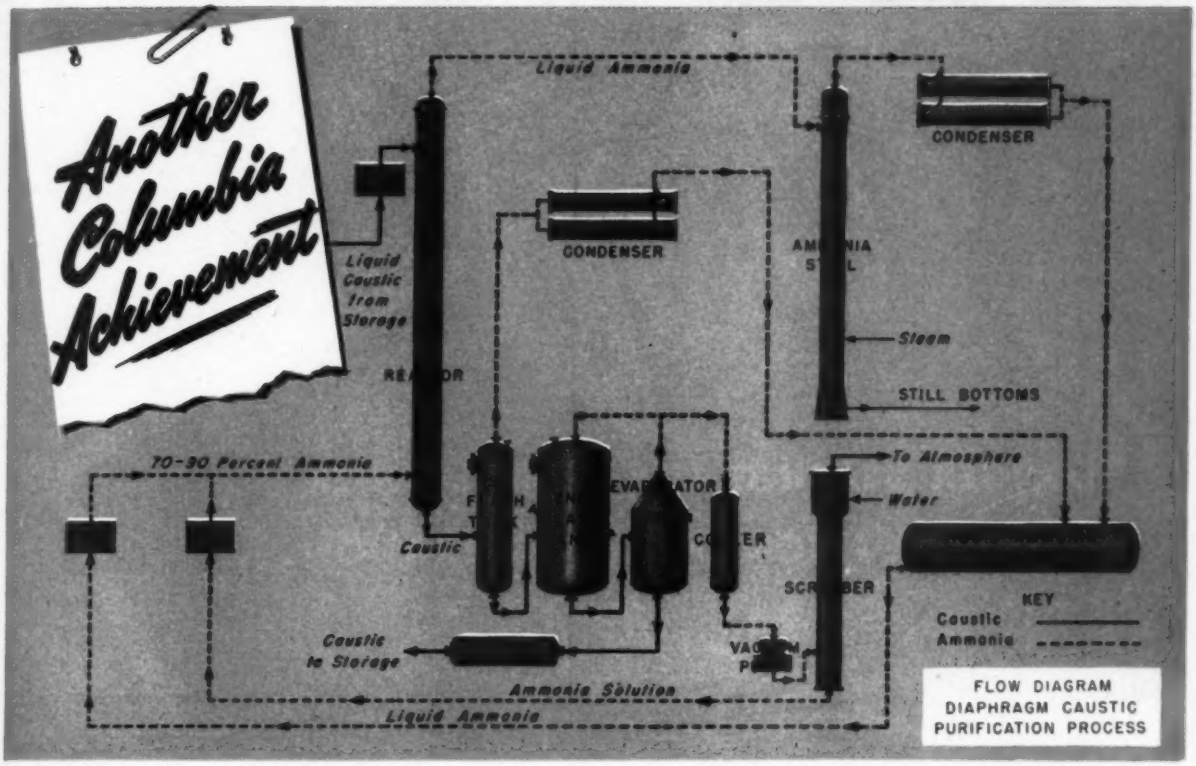

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Columbia's patented purification process for diaphragm electrolytic Caustic Soda has been an important factor in supplying essential industries.

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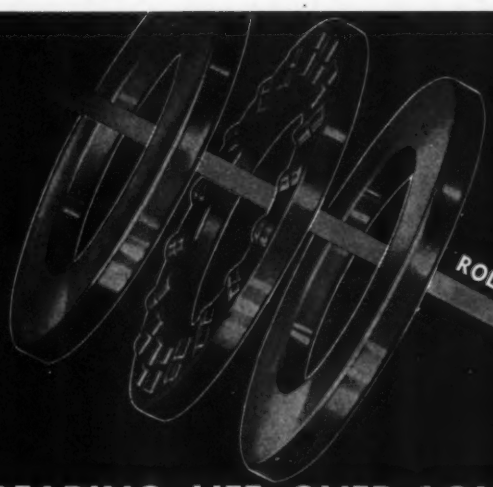

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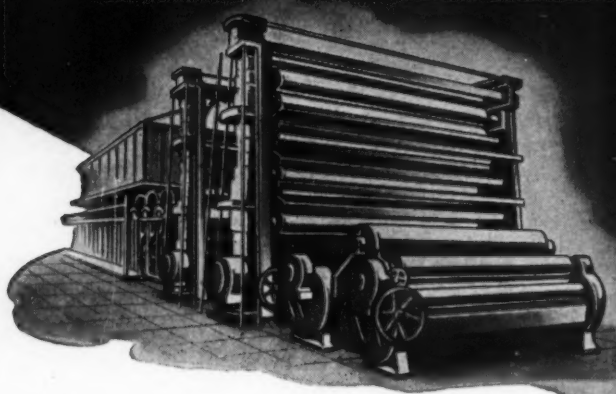

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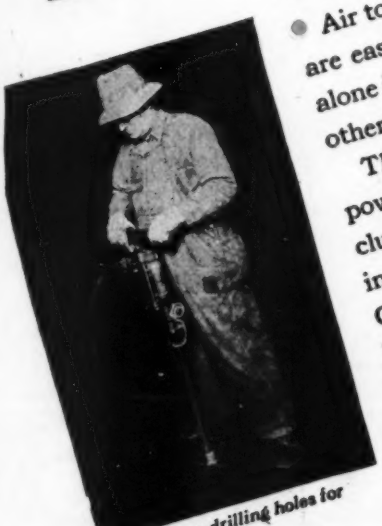

Jackhamer drilling holes for foundation bolts

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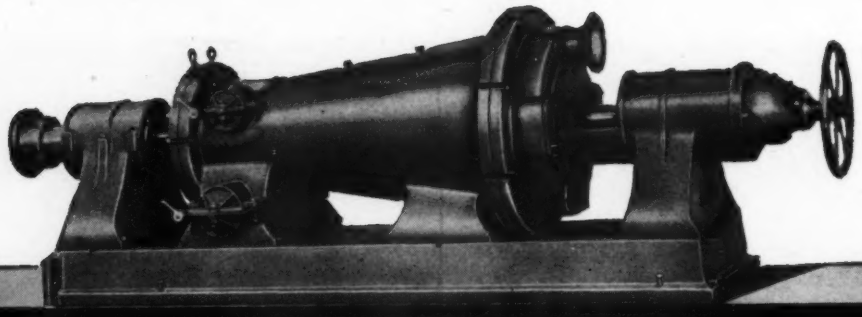

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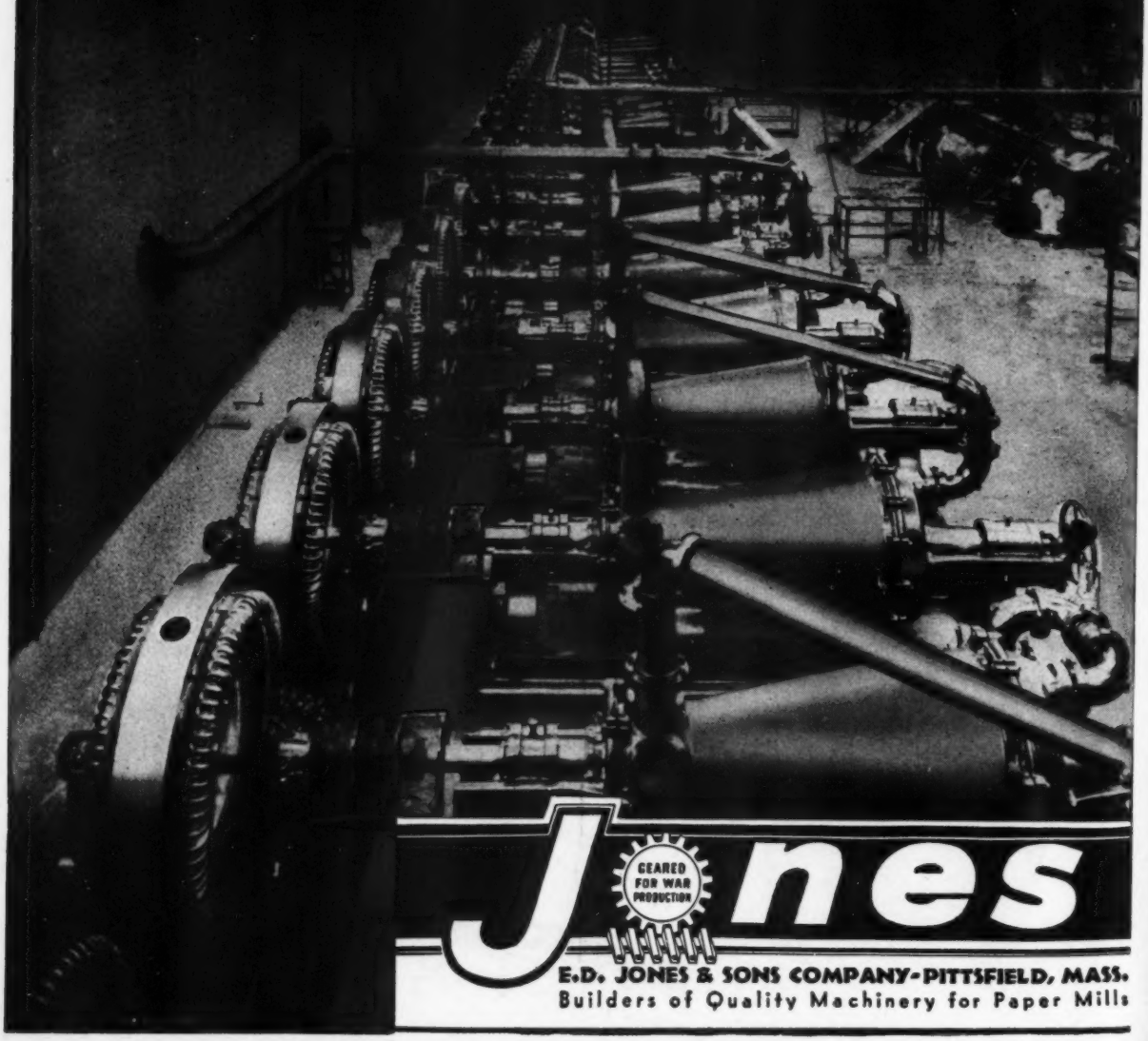

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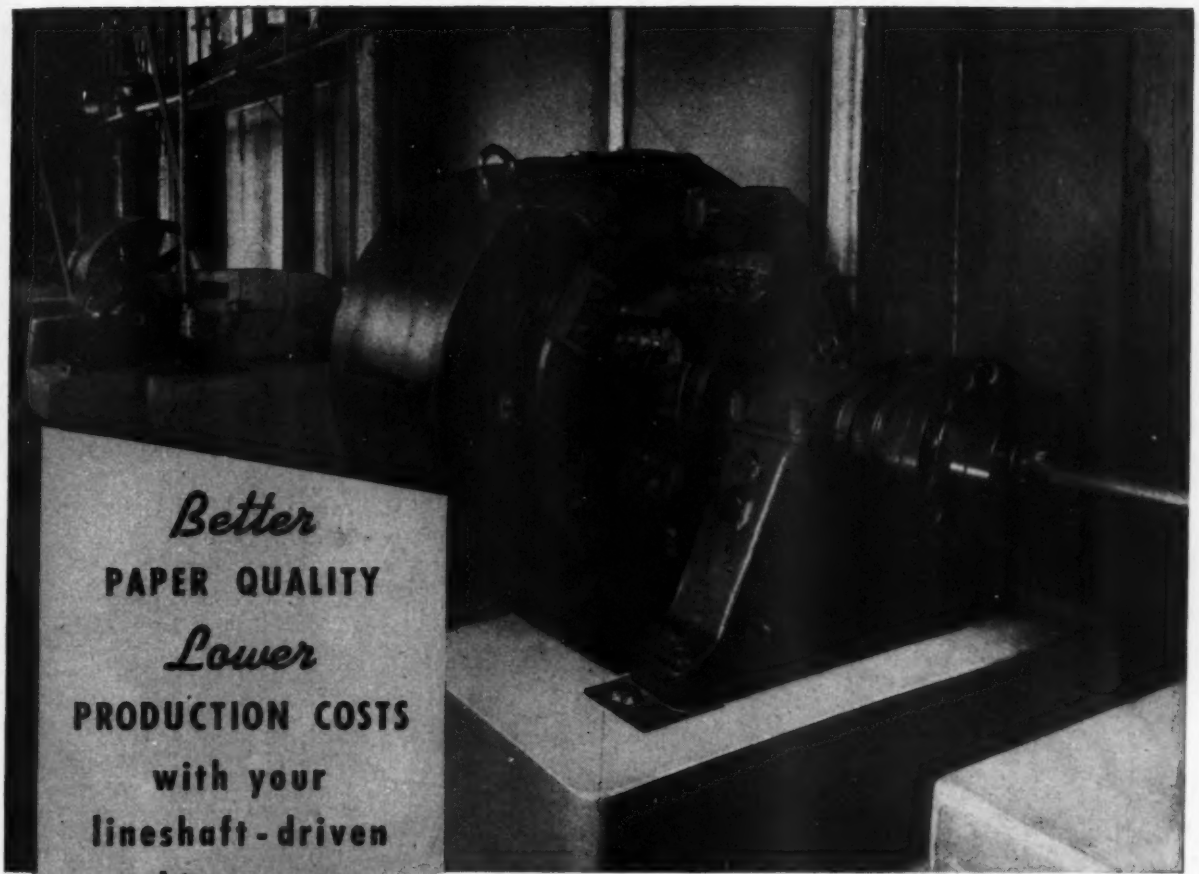

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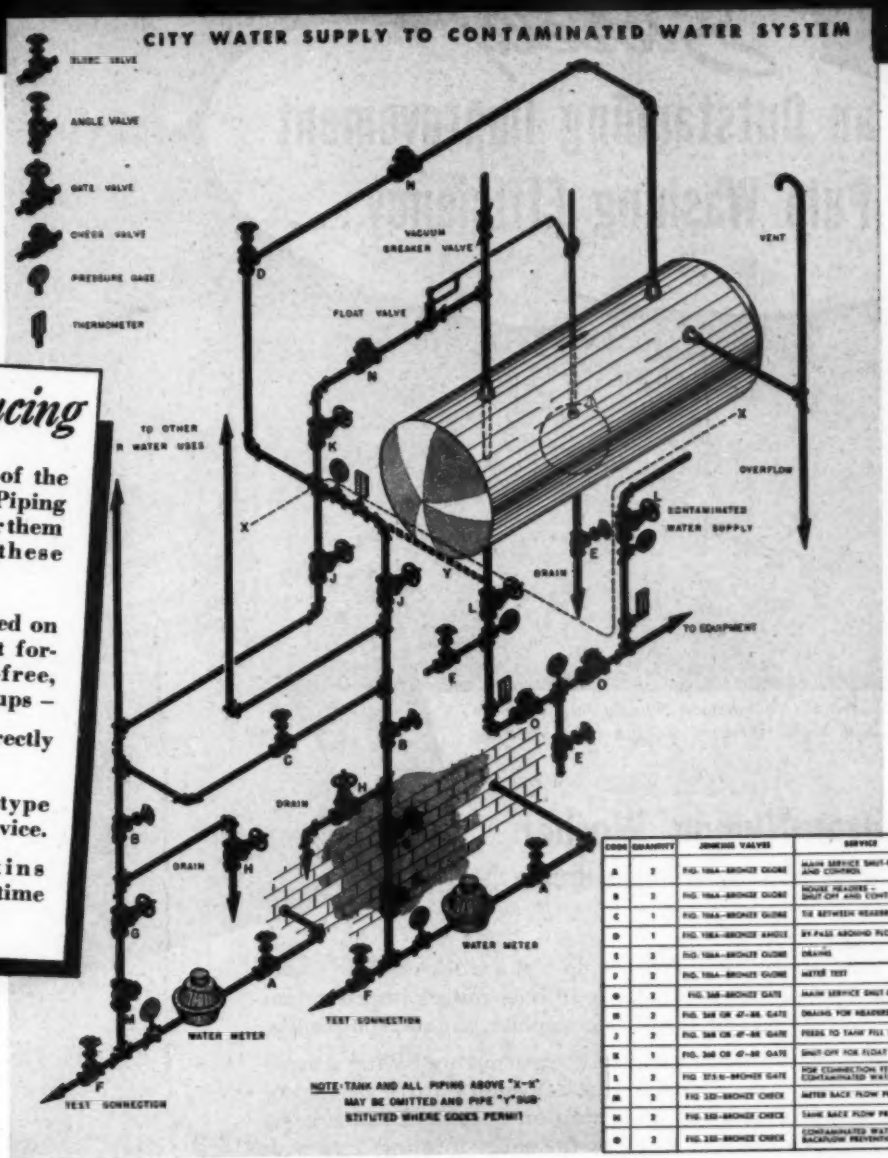
Jenkins PRACTICAL PIPING LAYOUTS 1

CITY WATER SUPPLY TO CONTAMINATED WATER SYSTEM



CODE	QUANTITY	JENKINS VALVES	SERVICE
A	2	FIG. 106A—BRONZE GLOBE	MAIN SERVICE SHUT-OFF AND CONTROL
B	2	FIG. 106A—BRONZE GLOBE	HOUSE HEADERS—SHUT-OFF AND CONTROL
C	1	FIG. 106A—BRONZE GLOBE	TEE BETWEEN HEADERS
D	1	FIG. 106A—BRONZE ANGLE	BY-PASS AROUND FLOAT VALVE
E	3	FIG. 106A—BRONZE GLOBE	DRAINS
F	2	FIG. 106A—BRONZE GLOBE	METER TEST
G	2	FIG. 348—BRONZE GATE	MAIN SERVICE SHUT-OFF
H	2	FIG. 348 OR 47-48 GATE	DRAINS FOR HEADERS
J	2	FIG. 348 OR 47-48 GATE	FEEDS TO TANK FILL LINE
K	1	FIG. 348 OR 47-48 GATE	SHUT-OFF FOR FLOAT VALVE
L	2	FIG. 325-BRONZE GATE	FOR CONNECTION FEEDING CONTAMINATED WATER SUPPLY
M	2	FIG. 320—BRONZE CHECK	METER BACK FLOW PREVENTION
N	2	FIG. 320—BRONZE CHECK	TANK BACK FLOW PREVENTION
O	2	FIG. 320—BRONZE CHECK	CONTAMINATED WATER SUPPLY BACKFLOW PREVENTION

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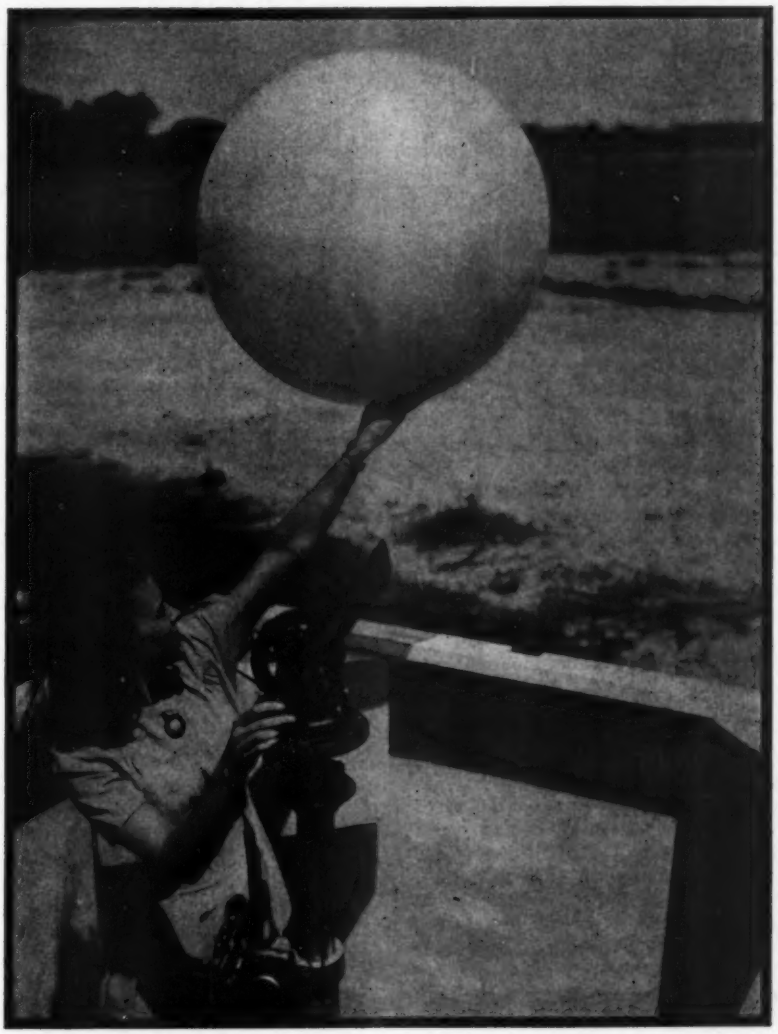

Releasing pilot balloon for observing wind directions and velocities aloft

Weather Service for the Paper Industry

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Meteorologist
U. S. Weather Bureau

▶▶▶ A VISITOR who has listened to a meteorologist describe the wide scope of Weather Bureau activities is often heard to remark "What I did *not* know about the weather!" And, speaking for meteorologists, I hasten to say that we know little or nothing about the pulp and paper industry. To me, at least, the industry suggests little more than a huge pile of wood, a large mill beside a stream of water, and the distinctive odoriferous atmosphere surrounding some mills—especially if the wind on one's approach happens to be "on the nose."

To begin with, one might ask "Just what right has a weatherman to be curious about the paper industry?" It may well be that weather has little or no bearing on the chemical or the mechanical aspects of the industry. But on the agricultural or fibrous raw material side, the jurisdictional claims of the weather man rest on solid ground—and that jurisdiction easily may be extended to include ample water.

With the paper industry ranking sixth in size in the United States, and with paper really a number one critical war material, it is quite appropriate that the industry ask itself whether or not full advantage is being taken of available weather service. No doubt practically everyone is familiar with the daily weather forecast and special warning service, but probably only a small proportion of the public is cognizant of the full scope of the Weather Bureau service to air, land and water transportation, as well as to agriculture and industry.

Our first problem then, and a seemingly simple one, is to get industry to utilize the advance weather information that is available. Unfortunately many businessmen still seem to be of the opinion that weather forecasting service is available only to the military services. Nearly all military restrictions on the dissemination of weather information were relaxed over a year ago. Our special warning service was never restricted. In spite of this, one Chicago manufacturer was losing $10,000 a year on LCL shipments alone because he did not know that information as to expected minimum temperatures was available for more than thirty-six hours ahead, or for a distance of more than three hundred miles from Chicago. A gas company in the North-Central States tried to operate for a time without temperature forecasts and cold wave warnings. A severe cold spell cost this small company $50,000.

When many inquirers express surprise upon discovering that almost any type of weather information can *now* be obtained, forecasters soon become convinced that unfortunately some persons having critical need for forecasts and warnings are not receiving service that the Weather Bureau is in position to give. The Bureau does not seek to "sell" its service, but over and above public welfare (which is its chief responsibility), it suggests that industry utilize a weather forecasting service that can be had for the asking, insofar as personnel and facilities permit under wartime conditions. After the war, of course, many military meteorologists may be eager to serve as private meteorologists for large companies or groups of companies.

Our second problem is that of fitting the forecast service to the specific

needs of the user. To use a classic example, the housewife doesn't care particularly what the pressure, temperature, humidity, wind, ceiling, or visibility happens to be when she calls. She usually wants to know whether or not rain is going to spoil her wash day.

The forecaster wants to know not only what weather changes are important to user but also just what precision will be needed in order to make his forecasts useful. It may well be that the precision required is beyond the accuracy that can be expected in the present state of the science of meteorology.

The user must in some way be told just what the Weather Bureau has to offer and he in turn should explain his particular problems that are in any way related to weather. The best way to explore each other's problems appears to be through mutual liaison or familiarization visits.

Before tackling our most difficult problem, that of limitations and accuracy, let us take a brief look at the atmosphere itself and the forecaster's most vital and interesting document—the weather map. The vertical thickness of the atmosphere is so small in comparison to the size of the earth that, in proportion, it would be as thin as a sheet of tissue paper twisted around an orange. Yet, in the middle latitude, three-fourths of this vital gaseous envelope, by weight, extends upward about seven miles. This lower portion of the air we breathe is known as the troposphere. Just about all the factors which make up the weather as we know it, clouds, wind, rain, snow, sleet and hail, occur in the troposphere. in motion, thanks to the power of the sun and the rotation of the earth. How it moves over the earth is the key to all weather. Like swirling water in a stream, but far more complex both in composition and action, the weather moves endlessly onward day and night. In varied states of heat and cold, wetness and dryness, violence and calm, it enters the United States from the Gulf, from the Pacific or Mexico, from Canada and Alaska, a mingling of many currents, warmed over the desert, cooled over the water and the forests, taking moisture here and losing it there, with clouds and sunshine, snow, rain and winds, all of which go to make our daily weather.

Several times during the day and during the night a small army of observers send reports to central stations by telegraph, teletype, telephone or radio, and they are distributed over the teletype system to weather offices where they are entered in their proper places on weather maps. When all the observations are entered and the weather map is completed we have a picture about two hours old showing the weather over the United States and adjacent areas of the continent and oceans.

Since weather is a three-dimensional affair, above us as well as around us, it is necessary also to have information as to conditions above the earth's surface. Small balloons are freed and observed as they rise, to give a measure of the air currents at various levels. Larger balloons carrying miniature weather and radio stations are launched to send back radio signals indicating the pressure, temperature and humidity at various heights.

The weather forecaster analyzes and studies these upper air and surface charts which, after all, are only *momentary* pictures of the everchanging weather situation. He examines the previous charts to see what changes and movements have taken place and then he attempts to visualize what this complex picture of the atmosphere over the United States or a given part of it will look like in the next twenty-four to forty-eight hours. It isn't an easy task.

Abruptly the weather may begin to move with unsual rapidity or it may slow down and become almost stagnant. Storms and cold waves, once developed, are foretold in their progress from place to place with accurate forecasts and warnings. Sometimes, however, the forecaster sees the beginnings of what may later be a storm, cold wave, or other severe weather condition, and for the moment no one can be sure whether it will actually develop into something of a severe nature or will eventually be nothing more than a mild change in the weather. He must wait an hour or possibly as much as six hours to get another picture of the weather in that section. If he is too hasty he may cause unnecessary alarm, adversely influence business activities and cause inconvenience to the general public; and his warnings on future occasions when severe weather actually impends may be partially discredited. The best practice, therefore, is to issue an "alert" and then wait until another set of reports comes in before issuing a warning of severe conditions. It is on this point of preliminary or provisional notices that weather probabilities and possibilities rightly come into the picture.

Whenever forecasts are extended to cover three to five days ahead it is especially important that users fully understand these limitations. Even with one to two day detailed forcasts there arise occasional errors in timing and marginal errors in areas to be affected. Therefore any operational planning based on weather must necessarily be kept fluid and flexible, particularly for the third to fifth day ahead.

Forecasters have found, too, that these limitations may best be handled by *daily* contacts by telephone, telegraph, teletype or radio and that the nearer any specialized service can come to being personalized and humanized the more successful it becomes. Meteorologists soon learn that production, traffic and sales managers, purchasing agents, engineers, dispatchers, transportation superintendents, in short, operational heads in any line of business, are wrestling daily with the overall problem of compromising and harmonizing variables and unknowns in meeting schedules and contracts and that *one* of the variable or unknown factors is *weather*. Similarly, businessmen soon realize that weather forecasters also are struggling with many variable and unknown factors that go to make up a reasonably accurate prediction. By the very nature of their mutual problems they will appreciate and respect each other's limitations.

One of the laments of weathermen, incidentally, was well summed up by Grantland Rice:

"And now among the fading embers,
These in the main are my regrets,
When I am right, no one remembers;
When I am wrong, no one forgets."

The way popular literature persistently emphasizes either one or the other of two extremes regarding the accuracy of forecasts deserves mention. One extreme, probably led by an older school of thought and perhaps the result of sad experiences with earlier day forecasts, insists, jokingly, that the weatherman is always wrong. The other extreme exaggerates any claim that weather can be forecast accurately weeks and months in advance. Such claims, of course, are in the same category as those that place a helicopter in every back yard and every man living in a strange prefabricated dream house full of push-button industrial marvels to be.

That the war, largely through the expansion of aviation, will lead to advances in meteorology there can be no doubt. New techniques and new instruments will result. Research and experiment by meteorological services, military services and universities will help unravel the secrets to more successful forecasts. Perhaps industrial research will lend a hand. Future progress will be evolutionary rather than revolutionary.

One further reason, then, why per-

fection in forecasting should not be expected lies in the fact that meteorology has had to await developments in thermodynamics, hydrodynamics, aerodynamics and electronics. Actually there are weather phenomena not yet fully and scientifically explained. Until satisfactory solutions to some weather problems are reached dependence must continue largely on the basis of experience which is not too satisfactory.

Assuming then that the forecaster foresees all developments on the weather map, and in the great majority of maps this will be the case, lets take a realistic look and see just what can be and what cannot be forecast in the way of wind, temperature, humidity, clouds and precipitation.

Wind—For any exposed location wind direction can be forecast quite accurately. This is fortunate because without first knowing the trajectory of air masses it would be next to impossible to extrapolate their weather characteristics. Wind velocities of fifteen to seventy-five miles per hour for exposed locations can be forecast within a twenty per cent leeway. These are average velocities for a minute but aviators and structural engineers concerned with possible velocities at any instant should allow fifty to one hundred per cent for gustiness.

If the location is sheltered by trees, buildings or hills a special study should be made to determine the local effects. An exception also should be made for thunderstorm and tornado winds. These usually cover small local areas and until such local storms actually develop there is ittle hope that the different directions and velocities can be foretold.

Temperature—For any particular location the error in maximum and minimum temperature forecasts will average plus or minus two to four degrees. Here again locations near bodies of water or in valleys or on mountains mean sizable exceptions to a forecast covering a large district. The time temperatures will begin to rise or fall can be given within an hour or so; also the extent of the temperature change.

Humidity—Relative humidity can be forecast within about ten per cent and dewpoints within about 4 degrees.

Clouds—The degree of cloudiness usually can be foretold within three or four-tenths of sky cover. Cloud thickness can be indicated with a good degree of accuracy.

Precipitation—The beginning and ending of rain or snow can usually be forecast within two hours. Total precipitation for any storm on a basis of light, moderate or heavy is reasonably accurate eighty per cent of the time. Actual amounts of rainfall or snowfall during any storm are more difficult to forecast. Local summer showers, like thunderstorms, are almost too difficult to spot.

General view of a Weather Bureau Airport Station showing instrument shelter in immediate foreground and wind instruments on roof of observation tower

Freezing rain (ice glaze) and sleet (ice pellets) can be predicted about eighty-five per cent of the time. Belts of freezing rain, as well as belts of heavy snow, are usually narrow and depend largely on accurate temperature forecasting. These factors increase marginal errors.

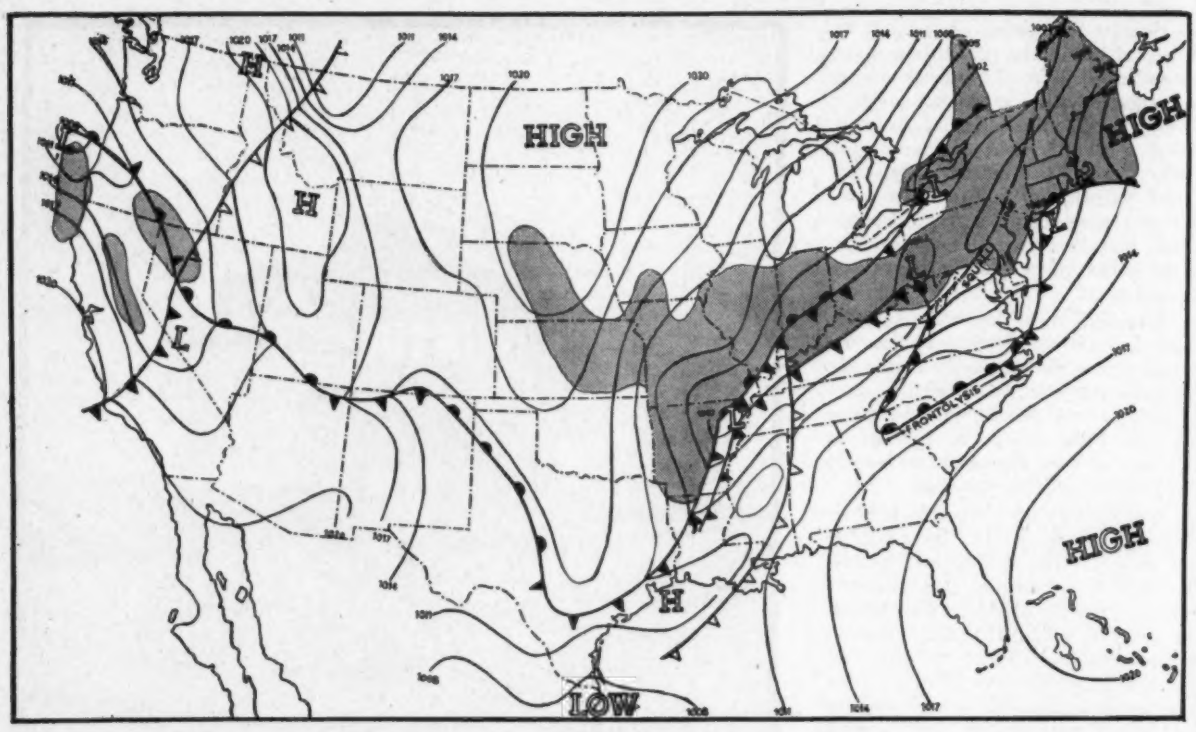
Thunderstorms—Forecasters are not at all optimistic that exact areas or times can be given in advance of development. However, we can indicate when thunderstorms are likely to occur over certain areas. A thunderstorm is often likened to a shot from a gun. We know when the gun is fully loaded but we do not yet know just what conditions pull the trigger.

Therefore, with due allowance for local variations and for time and area limitations, it can be stated that present day meteorology is able to provide reasonably accurate and detailed forecasts, up to two days ahead, of general wind direction and velocity, temperature, humidity, cloudiness and precipitation, and forecasts of a more general nature of most meteorologists that weather expectancies based on climatological statistics over a long period of years will form the best guide. Climate, after all, is nothing more than accumulated weather and both past and current weather information is 100 per cent accurate.

The effect of weather on the paper industry would appear to fall largely into three fields, namely, outdoor operations, water resources and equipment.

In general, all outdoor operations will be affected by snow or rain, high winds, and low and high temperatures. With fairly accurate two to five day outlooks general outdoor operations can be planned in advance and carried through more successfully.

It was most interesting to note from two recent articles in THE PAPER INDUSTRY AND PAPER WORLD ("Pulpwood Transportation in the Lakes States," J. V. Martin, July, 1944, and "Pulpwood Handling," W. W. Henderson, December, 1944) that about one-sixth of the country's pulpwood production is used by some fifty-five pulp mills in Wisconsin, Michigan, and Minnesota, and that while approximately one-half of this supply comes from a territory within one hundred and twenty-five miles of individual mills the other fifty per cent comes



Weather Map—Shaded area indicates current precipitation. Note series of low-pressure areas from the north Pacific Coast southeastward to lower Rio Grande Valley, and thence northeastward to St. Lawrence Valley. These areas indicate typical storm path producing heavy rains and floods in shaded areas

from points two hundred to more than one thousand miles distant. Considerable is imported from Canada and thus the Great Lakes and their waterways are used to a large extent. Whether water transportation is by steamship, barge or raft it will pay operators to be on the alert for rough weather, even during the summer months. Barges, rafts and tugs would be especially vulnerable on any of the Great Lakes. Both the United States and Canadian weather services issue storm and small craft warnings as the weather requires. Regular wind and weather forecasts are issued every six hours for each of the lakes during the open season. (During the closed season, advisory weather is available from any Weather Bureau Office on request.) Six-hourly lake forecasts are known as "lafots" (contraction for "lake forecast transmissions.") All boats plying the Great Lakes should be equipped to receive lafots via short wave radio.

Truck and rail transportation will also find weather forecasts and warnings helpful in their operations. Next to agriculture no industry is more dependent on weather conditions than is transportation. Since trucks are now in general use all along the line from cutting operations to the mill and throughout the year in most areas their operators should have the benefit of heavy snow, cold wave and ice glaze storm warnings.

Such warning also would be useful in planning construction, maintenance and repair work at mills. Our favorite example along this line is that of a midwestern construction firm that saved $1,000,000 by knowing when to pour concrete for war factories. One large contract was finished three months ahead of schedule.

Reroofing operations, especially when machinery has to be exposed for several days, offers a difficult forecasting problem. Roofing compounds and paint are not shipped if there is danger of freezing enroute. Outside painting is much delayed in rainy weather. Low temperatures and strong winds delay the construction of high chimneys. Carload shipments of sand and gravel freeze, not only delaying work but also increasing work and tying up cars. General repair and replacement programs are postwar problems but with labor, materials and transportation so inadequate at present any advantage offered by weather should be seized.

The paper industry is fortunate in that its shipments of raw materials, chemicals and products are not damageable in transit by high or low temperatures. However, it may well be that heavy rains or floods could cause considerable damage. Hurricanes and their wind and water damage are doubtless properly feared throughout the Gulf and Atlantic States. No doubt various paper products, supplies and machinery require speedy replacement or demand repairmen from a distance.

As to the effect of weather on the power plant or power supply an excerpt from a recent damage report reads like this: "Winds and ice glaze broke down two main power lines causing several hours loss of time in paper mill." Electrical storms occasionally damage transformers or otherwise interrupt power service. Some damage and delay due to severe weather is inevitable, but power supervisors and dispatchers find warnings of thunderstorms, windstorms, ice glaze, heavy snows and cold waves indispensable in rerouting and reallocating power loads and in being prepared to meet suddenly increased loads with adequate spinning reserves.

Water is vital to the manufacture of pulp and paper. It is also potential power to run the mills. Some paper companies sell surplus power. Hence rainfall and the state of streams assume paramount importance.

The matter of water resources resolves itself into problems of both short-term and long-term management. Quantitative precipitation forecasting is most difficult but it is

proving to be of considerable assistance in short-term management of water serves, particularly in headwater regions. If the time and amount of precipitation can be estimated in advance, then an amount equal to the run-off can safely be withdrawn from reserves. Run-off, of course, will depend on the intensity of the rainfall, the temperature, melting snow, character and moisture content of the soil, state of vegetation and the topography of the drainage basin, not to mention evaporation. Fortunately, major storms covering large areas and producing the greater amounts of total rainfall can be forecast more accurately than can showers and thunderstorms which may vary an inch or more in amount within a few miles.

The problem of maintaining sufficient water reserves and the economical use of such reserves applies even more forcefully in long-term management. Since there is no satisfactory method of making reliable forecasts far enough ahead for long-term management, the only alternative at present is to work from climatological records. Such records will indicate maximum, minimum and average precipitation for any drainage area.

Every kilowatt-hour of electrical energy produced from waterpower saves a pound of coal. And since there is a recognizable limit to the recoverable amount of stored energy in coal, gas and oil won from the earth, there likewise is a feeling among hydroelectric engineers that no kilowatt-hour, within watersheds serving hydroelectric generating plants, should be wasted. Therefore, from the standpoint of conservation as well as from other angles, it is only logical for hydroelectric engineers to expect all possible assistance from the Weather Bureau's forcasters, hydrometeorologists and hydrologic engineers in matters of precipitation, evaporation, run-off, ice-growth and ground water storage.

The effects of weather changes on plant equipment would appear to lie in the amount of protection required for water lines, steam lines and power plant. Since papermaking is largely a dehydration process we cannot help but suspect that variations in outside air temperature and humidity are important. Certainly weather forecasts will be found useful in connection with plant heating, ventilating and air conditioning.

On week-end repair jobs plans must be made in advance and money can be saved by hiring men only when the weather permits the work to be done. Neither should the acute manpower angle be overlooked. With the need for speeded up production all along the line never greater, weather service should be examined for any possible increase in efficiency. The beneficial effect weather information for employees could have over a year's time in decreasing absenteeism and maintaining production in any large industrial area must be extremely significant.

Popular interest in weather needs no proof but there are significant figures in at least two large industrial areas on the number of daily telephone calls for the recorded type of weather forecast, changed or checked hourly and furnished by teletype to the telephone company. New York City recorded 155,000 calls on September 14, 1944, during the hurricane. Chicago recorded 152,000 on a subzero day, January 2, 1945. And the all-time peak at Chicago, occurring on a frigid day in January 1942, was 251,499.

In the matter of adequate and timely dissemination of special forecasts and warnings group organizations, trade associations, exchanges and councils should share the responsibility with the Weather Bureau. Individual companies in some interested lines of business number in the hundreds and it is physically impossible for the Weather Bureau to warn all of them promptly, unless, of course, radio is used. Even so, it just isn't fair for departmental heads to have to wait until they turn on their radio or see their newspaper or their wives call from home in order to discover that important weather news is in the making. Adequate distribution within a large company, not only interdepartmental but also to subsidiaries, certainly comes under private enterprise and not government service.

We would hardly be expected to refrain from mentioning the valuable job done with the Atlantic hurricane September 8-16, 1944. An editorial from the *Philadelphia Record*, entitled "The Real Hero of a Hurricane is the Weatherman," raised its eye-brows as follows: "This startling thought occurs: Suppose there had been no Weather Bureau, no warnings?"

In conclusion, our country always has been rather wasteful in matters of production, distribution and consumption. Unnecessary weather losses have been taken along with other extravagances. Beyond the common sense of not overlooking a good bet there is the claim of the consumer. So many raw materials and finished products are in short supply that any loss or any lost time may result in the consumer having either to do without, wait, or pay a higher price. To the extent that such things can be avoided by the use of a specialized weather service to that extent is the consumer benefited.

We believe we can work together to profit from a knowledge of weather and avoid unnecessary inconvenience, discomfort, danger, and loss of life and property. Weather admittedly is one of the greatest hazards to business but it also may be considered as an inexhaustible natural resource which business can find profit in exploiting.

We look forward hopefully to the time when we will know more about the atmosphere and will be able to serve you better. In short, research and improvement on our side will depend to a large extent on the demand made by those who need our services. Money and personnel most certainly will be supplied by the Government *only* in proportion to the need shown.

EDITOR'S NOTE: The accompanying table was published on page 216, of the May, 1945, issue of THE PAPER INDUSTRY AND PAPER WORLD as part of the article "A New Stain for Identifying Papermaking Fibers," by Norval F. Wilson, chief chemist, Alton Boxboard Company. The table is reproduced herewith because of some confusion having arisen through the use of the abbreviation gr. instead of g. for grams.

TABLE I—Preparation of the Stain Solution

Iodine crystals, C.P.	0.8 gram
Cadmium Iodide, C.P.	35.0 grams
Distilled water	50.0 cc.

Heat the above to 110 Fahr. and break the Iodine crystals with the end of a stirring rod. Decant the solution from one beaker to another to observe the point where no undissolved solids remain. Then add the following, in order, with stirring:

Distilled water	90 cc.
Formaldehyde	7 cc.
Calcium nitrate, C.P. $Ca(NO_3)_2$ $4H_2O$	70 grams
Cadmium chloride, C.P. $CdCl_2$ $2\frac{1}{2}$ H_2O	20 grams

Enclosed Gear Drives—Their Installation and Maintenance in the Paper Industry

A. M. COOPER[1] and O. P. ADAMS[2]

▶▶▶ GEAR DRIVES of fully enclosed type, generally designated as gearmotors and speed reducers are extremely important items of power transmission equipment in every paper mill today. Gearmotors and speed reducers are applied in some form on practically every machine which operates at slower than prime mover speed. The individual sections of the paper machine, machine auxiliaries, agitators, supercalenders, and other finishing machine drives are important users of enclosed gear drives.

The care of these drives is an important operating problem which should be given every consideration. A definite and fully supervised inspection and maintenance program provides insurance against high maintenance costs, trouble is detected in its preliminary stages, and outage time kept to a minimum.

Over the past few years, the gearing industry has made a considerable amount of progress in the development of standards for enclosed gear drives. Such standards play a most important part in the design, manufacture, and application practices of the gearing manufacturer, and have become a well-recognized part of the paper industry specifications for equipment of this type. Improvements in manufacturing processes have gone hand in hand with the development of such standards so that today, enclosed gear drives should be considered as precision machinery built for specific applications. They represent an appreciable item of investment, and in most instances, must operate 24 hours per day and 365 days per year. They also operate underconditions far from favorable, such as industry or moisture-laden atmospheres, which can be detrimental.

An adequate maintenance program does not require an elaborate setup or organization. On the contrary, enclosed gear drives, in spite of their accurately machined parts, are simple in construction, and the rules for proper maintenance are equally so. Competent men, generally familiar with mechanical equipment, and a definite time schedule for routine inspection provide two big steps on the way to trouble-free service.

Figures 1 and 2 are typical of two horizontal parallel-shaft types of enclosed gear drives in wide use today, and this discussion will be confined to units of this type. For convenience, the several maintenance items which are discussed have been identified in Check Charts I and II.

Preventive maintenance begins with the selection of a drive of proper capacity for the application. As mentioned earlier, this has been much simplified and well defined in the standards and published application data of the gearing manufacturers. In the majority of cases, selection can be made at once with entire safety from such data, and where this is not possible, a complete statement of the problem will immediately bring specialized recommendations from the manufacturer. Such statement should be specific as to the type of equipment to be driven, type of prime mover (particularly if other than an electric motor), and the duty cycle, including hours per day in operation, and frequency and magnitude of any peak loads to be handled.

Beyond this, the continuous efficient operation of any enclosed gear drive depends on three factors which are equally important from the standpoint of both preventive and regular operating maintenance.

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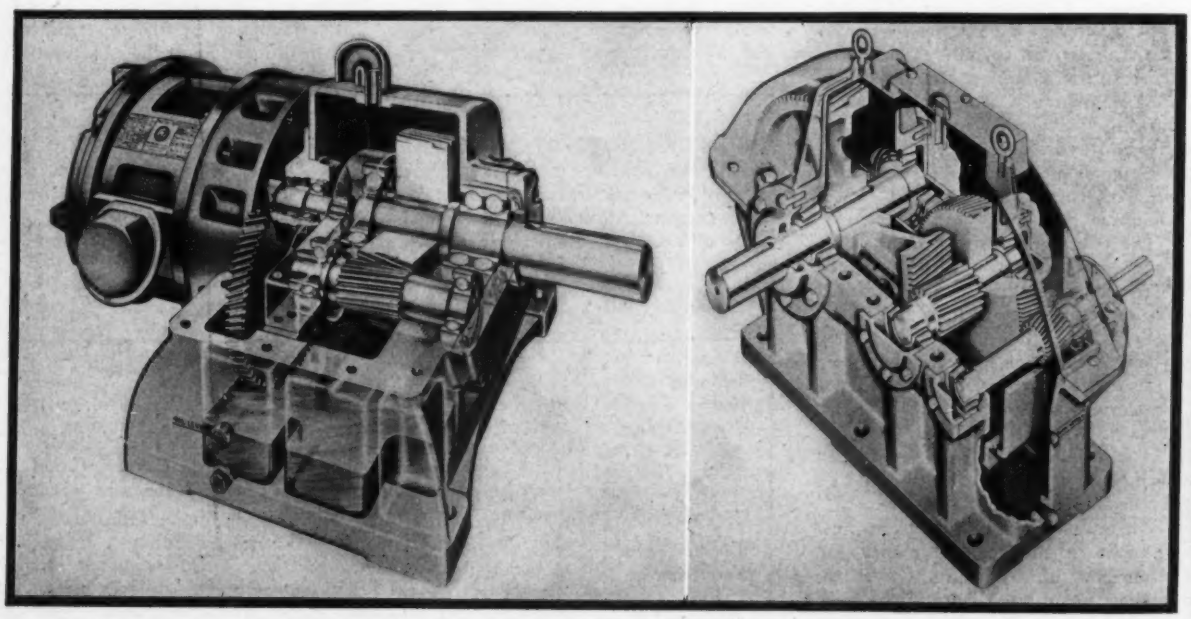

Fig. 1 (left)—Cutaway view of typical gearmotor. . . . Fig. 2 (right)—Cutaway view of typical horizontal parallel shaft type speed reducer

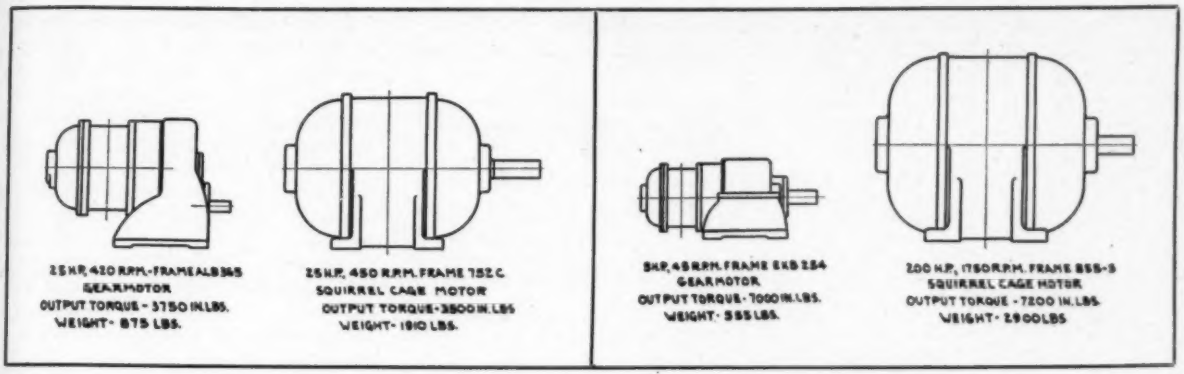
25 H.P. 420 R.P.M. - FRAME ALB 365
GEARMOTOR
OUTPUT TORQUE - 3750 IN. LBS.
WEIGHT - 875 LBS.
25 H.P. 450 R.P.M. FRAME 152 C
SQUIRREL CAGE MOTOR
OUTPUT TORQUE - 3500 IN. LBS
WEIGHT - 1910 LBS.
5 H.P. 45 R.P.M. FRAME EXB 284
GEARMOTOR
OUTPUT TORQUE - 7000 IN. LBS.
WEIGHT - 585 LBS.
200 H.P. 1750 R.P.M. FRAME 885-S
SQUIRREL CAGE MOTOR
OUTPUT TORQUE - 7200 IN. LBS.
WEIGHT - 2900 LBS

Fig. 3 (left)—Sketch comparing physical size of 25-hp., 420 rpm gearmotor and 25-hp. 450 rpm squirrel-cage motor of equal output torque. . . . Fig. 4 (right)—Sketch comparing physical size of 5-hp., 45 rpm gearmotor and 200-hp., 1,750 rpm squirrel-cage motor of equal output torque

Chart I—Check Chart for Preventive Maintenance

Check	*Instructions*
1. Selection of Drive—Is it right for the job?	Application standards are well defined and published by all leading gear manufacturers for your guidance. Correct selection is easy.
2. Foundation or Mounting?	Make it solid! Common mounting for gear unit and prime mover wherever possible. If structural base, frequent tie-ins for rigidity. Check bolting after short run.
3. Alignment?	Give it a chance! Line it up correctly! Do not use flexible couplings to correct faulty alignment.
4. Lubrication?	Examine unit nameplate and printed instructions carefully. Use correct grade and amount of lubricant.
5. Trial Operation?	Recommended for all drives. Faulty mounting, alignment or lubrication readily detected. Change of lubricant also recommended after few weeks run.
6. Regular inspection provided for?	No separate or elaborate organization necessary. Competent men familiar with mechanical equipment all that is necessary. Can be readily combined with other mechanical maintenance inspection duties.

Adequate Mounting

A foundation or mounting which provides rigidity and prevents "weaving" or "springing" with resultant misalignment of the drive and machine is a fundamental "must" in the installation of gear drives. A concrete foundation is recommended whenever possible, and where the gear drive is coupled to the prime mover, a common bedplate is highly recommended. Where the drive is provided with a structural mounting in field installation, care should be taken in the construction to provide members of comparable proportions to bedplates as recommended by the gearing manufacturers, with frequent tie-in members to insure rigidity. For example, the thickness of the plate or pad to which the gear drive is bolted should be at least equal to the diameter of the holding-down bolts.

One of the things most frequently overlooked in the foundation or mounting of enclosed gear drives for speed reduction service is consideration

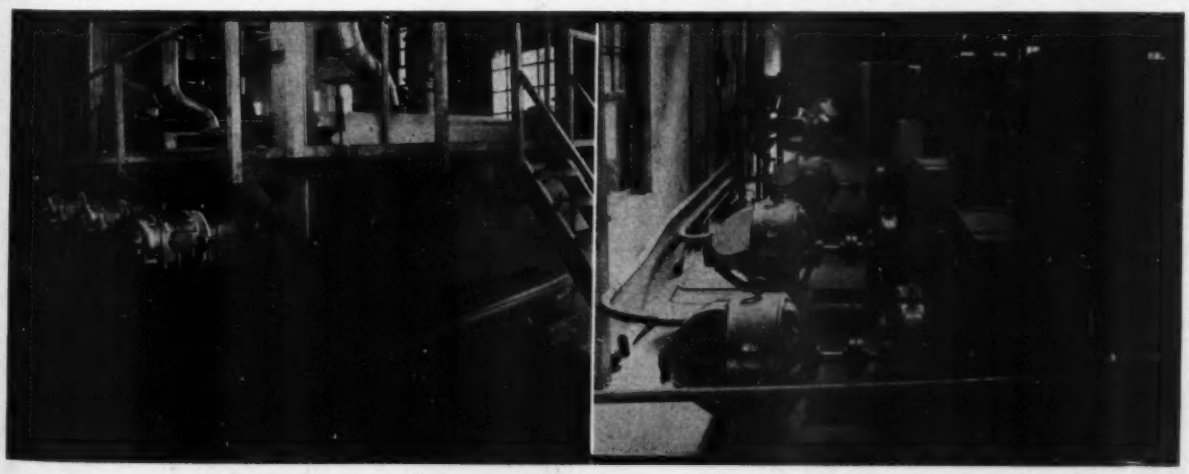

Fig. 5 (left)—A battery of gearmotors driving paper-mill stock washer. The foundation is designed with full consideration of the torque capacity of the drive. . . . Fig. 6 (right)—Variable voltage tandem calender drive in binder board mill, showing gear units connected to mill by open gear set.

Chart II—Check Chart for Operating Maintenance

Check	*Probable Cause*	*Instructions*
1. Unit noisy in operation?	1. Misalignment	Check system alignment and flexible elements of couplings if used.
	2. Faulty lubrication	Check oil level and grade of lubricant.
	3. Excessive tension if power take-off by belt or chain drive	Check alignment and tension of such auxiliary drive. (Driving pulley or sprocket should be mounted as close to unit as possible.
	4. Worn parts caused by natural term of service or result of (1) (2) or (3)	Adjust or replace worn bearings and other parts.
2. Operating temperature excessive?	1. Incorrect lubricant	Either cause readily checked by nameplate and printed instructions.
	2. Incorrect amount of lubricant	Fill to proper level, if check shows low oil level. Drain a portion if too high; too much may be as bad as too little. See that breather is clean and functioning.
3. Oil leakage?	1. Too much oil in unit	Recheck oil level with unit shut down.
	2. Clogged breather	Remove and clean breather.
	3. Loose bolts or nuts	Check all joint and end cap bolts and tighten if necessary.
4. Mounting bolts loose?	Usually vibration from (a) Fluctuating loads (b) Misalignment	Recheck system alignment and tighten all bolts.

of the comparable weight of the geared drive as compared to a direct-connected prime mover of the same horsepower and speed. The former usually consists of a high-speed motor and compact gear mechanism which provides high efficiency with resultant lower weight. This is particularly true of gearmotors where the integral construction of motor and gearing parts provides the maximum in compactness. Figure 3, showing a gearmotor and motor of approximately the same horsepower and speed, clearly illustrates this comparison. It is obvious that the torque, or work to be done, is the same for each, and the foundation or mounting should be designed on that basis. This same principle is carried still further in the example illustrated in Figure 4, where a comparison is made of a 5 hp. gearmotor with an output speed of 45 revolutions per minute which delivers torque equal to that of a 200 hp., 1,750 rpm motor. Mountings for the two-drives should, therefore, be comparable in rigidity and ruggedness. Figure 5 shows gearmotors driving cylinder and agitator rolls, where the mounting is calculated on the basis of the more usual direct connected slow speed motor.

The provision of a solid mounting or foundation for your drive will, in itself, go a long way to insure successful operation.

Installation and Alignment

Smooth operations and long service life are a natural result of careful alignment of the gear drive with its prime mover and driven machine.

Faulty installation with initial or resultant misalignment can very frequently be the cause of bearing failures, shaft or foot breakage, and excessive wear of working parts. Overheating and noisy operation are usually warnings of this condition, and a check for these two signs should be a part of every maintenance program. If possible, a careful inspection of the drive should be made immediately. Mounting bolts and nuts should be checked and tightened if necessary, and alignment of the drive and driven equipment carefully rechecked. Even though originally tight, the bolting frequently has been subject to some vibration, tending to eventually cause looseness, allowing some movement of the drive. An excellent safeguard for this condition is to check the bolting on each drive within a week or two after it has been installed and running, and, thereafter, at each inspection period.

Misalignment of the drive can usually be quickly detected in the couplings or other connecting means. Flexible couplings are generally recommended specifically for the purpose of providing smooth operation and absorbing of fluctuating loads for drive and machine protection. Too often, however, they are considered as a method of correction for misalignment with resultant excessive wear on the coupling parts themselves and the transmission of undue stresses into the gear drive, and the reaction is invariably trouble.

Quite frequently, the connection between gear drive and machine is an auxiliary power take-off by an open gear set, chain or belt drive, with driven member mounted on the gear unit shaft. Here again, initial correct alignment and maintaining it are of prime importance, just as in the case of couplings, and for the same reasons. Where such arrangement is used, care should be taken that the driving member is so selected that the overhung load is within the capacity of the drive, and should be mounted as closely as possible to the face of the gear unit, thus minimizing bearing loading (See

Chart III—Recommended Lubricants for Parallel Shaft Units as Regularly Specified by the Gearing Industry

VISCOSITY RANGE			RECOMMENDED LUBRICANTS			
Lubricant No.	Viscosity Range SUV Seconds		Unit Size	Ambient Temperatures Deg. Fahr.		
	At 100 Fahr.	At 210 Fahr.		0-40 Lubr. No.	41-100 Lubr. No.	101-150 Lubr. No.
1	180 to 240		Gearmotors—			
2	280 to 360		(All sizes)	2	4	5
3	490 to 700					
4	700 to 1000		Gear units—			
5		80 to 105	(Centers up to 20")	2	4	5
6		105 to 125				
7		125 to 150	Gear units—			
8		150 to 190	(Centers over 20")	3	5	6

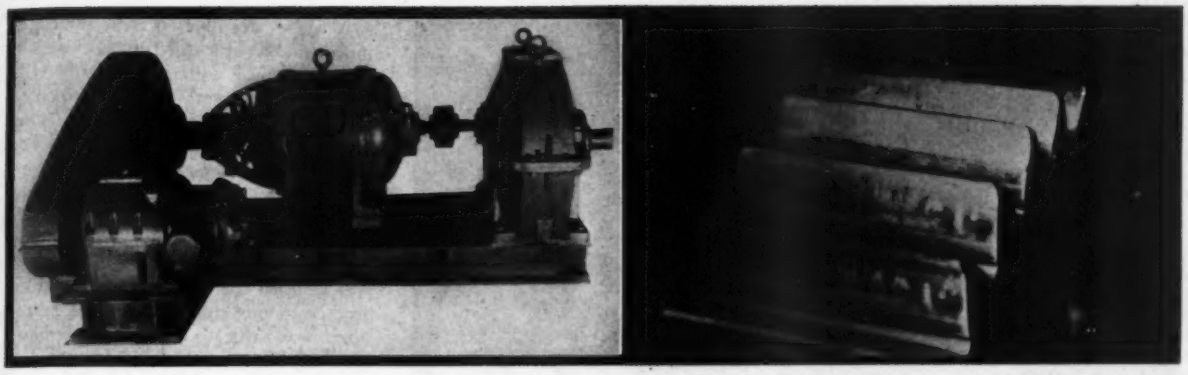

Fig. 7 (left)—Standard 2-motor supercalender drive, showing chain drive from gearmotor through overrunning clutch and chain drive, and gear unit for direct coupling to calender. Proper alignment of both units is essential. . . . Fig. 8 (right)—Typical illustration of "scoring" and "galling" of gear teeth, caused by faulty lubrication

Figures 6 and 7). The overhung load capacity is generally well defined by the manufacturer's specifications of the unit in terms of pounds or limiting diameter.

Where it is necessary to use a driving pinion, pulley, or sprocket of small diameter, or with a face width greater than the shaft extension length, the use of an extended shaft with an outboard bearing is highly recommended as insurance of the necessary added capacity for such excessive overhung load. Initial careful alignment of driving and driven members of such power take-off is essential and maintaining it is equally so from the standpoint of preventing excessive wear on the parts themselves and the transmission of unique stresses into the gear drive or driven machine parts.

Correct Lubrication

Gearing manufacturers regularly specify that lubricating oils for use with gear units should be high grade, high quality, well-refined petroleum oils. They must not be corrective to gears or to ball, roller or sleeve bearings; they must be neutral in action; free from grit or abrasives; and have good defoaming properties. For high operating temperatures, they must have good resistance to oxidation. Lubricants of the straight mineral type are specified for use with the unit types illustrated in this article.

Chart III shows the viscosity range of lubricants now generally recommended by the gearing industry, and identifies such lubricants by number for proper application over a wide range of ambient temperature. The gearing manufacturers also usually publish with their data typical list of lubricants, by recognized trade names, which conforms to these specifications. Such listing should be followed closely to insure correct selection of lubricant.

Tooth pressures produced in transmitting load are relatively large in comparison with the areas of contact on gear teeth, particularly when the construction of the drive is such that the gearing has been heat treated to provide maximum compactness and strength. It is, therefore, essential to provide a film of lubricant of sufficient strength to withstand such localized pressure and minimize wear.

The peripheral speed of the gears governs the period of tooth contact and determines the time during which the lubricant must stand up under such pressure. Light bodied oils usually are recommended for the higher speeds or lighter loads, becoming progressively heavier as speeds and/or loads are varied. Important variations in recommendations also are made depending on the room temperatures in which the drive must operate. Mineral oils invariably show a higher viscosity as the temperature is lowered, and generally a heavy grade of oil possesses a higher pour from the same lighter one poured from the same crude, unless a special treatment has been used to lower the pour point. Quite frequently, the use of different oils in summer and winter is recommended.

Faulty lubrication invariably is caused by either improper grade or amount of oil, and the results are very similar. It is usually readily detected on the profile of gear teeth, being characterized by "scoring" or "galling," depending on the degree of progres-

(Concluded on page 373)

Fig. 9—Gear units on sectional paper machine drive. Breathers are located on the cover plate of each unit

An eminent Divine once lent his name to promoting the sale of a paper product. (Courtesy of The Bella C. Landauer Collection in The New York Historical Society)

The Paper Collar—Highlights of Its History and Introduction

HARRISON ELLIOTT

▶▶▶ AN INTERESTING EXHIBIT of small boxes resembling miniature hat boxes may be found in the Bella C. Landauer Collection of Trade Cards, Posters and other advertising material, at the New York Historical Society. These boxes served to contain and display paper collars and cuffs when such wearables were more the vogue than today. The printed advertising on these containers bespeaks for paper collars and cuffs their practical utility, economy, style, and aid in keeping up one's personal appearance in collar-wilting weather.

A "blurb" on one container reads: "'*Linene*' for hot weather; will not wilt in hot or muggy weather; keeps shape and freshness. They require but little space, are comfortable, genteel and are quickly and easily adjusted, on cars, at the hotel, or in camp. Their many advantages are obvious to the experienced traveler." If that was not sufficiently convincing, there was the artistic touch given with such names as "Angelo," "Raphael," and "Rubens" for turndowns and a standing reversible which bore the brand name "Murillo." "Dante" and "Tasso" were proclaimed as possessing the desired requisites of elegance, shape, and finish, and were said to be "candidates for public favor." It is hoped they were elected by the elite.

The "Byron" patented in 1864 was of a style that was somewhat daring and aptly named. Prices for these masterpieces were 25 cents for a box of ten for gentlemen; cuffs, five pair for 25 cents. Collars for ladies sold for 35 cents a dozen, and six pairs of cuffs for ladies cost 20 cents. The list that bore these prices also stated that these wearables were "especially indispensable during the hot season when starched collars and cuffs wilt like plucked leaves." It was paper to the rescue, and good paper, too. One maker declared, "The paper used for my superior collars is made from linen rags, which makes them very strong on the button holes."

Back in 1866, a patentee offered an enameled paper collar for which it was claimed the enamel was free from any poisonous substance. This statement was made to combat the opposition of laundries that had started a whispering campaign to the effect that paper collars contained poisonous matter injurious to the wearer which would offset any economy in laundry bills and were likely to incur doctor's bills.

Looking for further information on the early history of the paper collar industry, I found in the Landauer Collection the book: *The Great Industries of the United States, being an Historical Summary of the Origin, Growth, and Perfection of the Chief Industrial Arts of the Country.* This book appeared in 1873 when the paper collar industry was in full bloom. What follows is taken from the chapter headed: "Paper Furnishing Goods."

"But the use of paper in the wardrobe of 'Young America' is of recent introduction. For centuries the Chinese have gayly clothed their idols in colored and gilt paper. The Japanese from time immemorial, have used paper pocket-handkerchiefs, carrying several in their pockets, using one and throwing it away, and from that custom claiming a cleaner, if not higher, civilization over the barbarians who carry a single silk or linen handkerchief which they use repeatedly, and as often return to their pockets. Paper overdresses, with lace paper collars and trimmings, are occasionally seen in masquerade and fancy balls. When Negro minstrelsy first became an institution in the United States, the 'end men' used to wear enormous collars cut from card-board or drawing paper; and years ago there was a common slander, sometimes well founded, that decayed and impecunious dandies wore paper articles of dress which might be at the wash, or to cover the dirt in the same article which should be at the laundry.

"It is singular, considering how close someone must have been to the discovery, that the invention of the almost universal paper collars and cuffs should have been so long delayed. But in 1853 paper collars for men's wear first appeared in New York, and the new goods soon spread to other cities. At first they were laughed at and ridiculed as exhibiting a sure sign of poverty in the wearer.

"Then came a horrible story that the paper possessed poisonous properties, dangerous to those who indulged in the new and cheap luxury of a clean collar every day for less than the cost of wash-

ing, and collars that might be turned and worn again before they were thrown away. Washerwomen rebelled against an invention which threatened to materially lessen the conventional dozen, more or less, of every customer per week. Society pronounced the new fashion low and vulgar. The makers of starch calculated the probable reduction in their sales. In fact, the paper collar created a commotion which largely helped to advertise it, and assisted in its introduction to popular use. All prejudices, even those against the most startling innovations upon established styles of dress, are easily worn away, and when it was discovered that the chief value of the paper collar lay, not in its cheapness, but in its convenience, the new fashion speedily became a success."

The manufacturers of paper collars made a very free use of the word "Garrote." Webster defines the word as a Spanish mode of execution by strangulation with an iron collar affixed to a post and tightened by a screw until life becomes extinct. Surely, the makers of paper collars did not intend that their product should be an instrument of death by torture, they had a more decorative and humane use for it.

But to resume the contemporary account:

"These garotte collars are known, according to their several peculiarities, as the 'Derby' after the celebrated Lord Derby, who devised the pattern; the 'Ray,' after one of the firm; and the 'Beecher Garrote,' after the illustrious preacher, Henry Ward Beecher, with his consent; and, *passim*, as illustrative of the tact of Yankee business genius and the democratic good sense of some of our clergy who are outgrowing the weak notion that they are demigods, or better than other people, it will not be out of place to quote here Mr. Beecher's reply, when applied to for the use of his name for collars. He was assured that the house would do no discredit to his good taste and name by their wares. Mr. Beecher's letter is as follows:

Brooklyn
March 3, 1869

"Messrs, Ray & Taylor,
"Gentlemen:

"My name has been used so much for all sorts of things that I doubt whether I could substantiate, in a court of justice, any claim to it; and, of course, it would not be fair to forbid you to use it.

"I hope your enterprise may be successful, and that the collars may be good enough for the name, and the name never disgrace the collars.

Respectfully yours,
Henry Ward Beecher"

The paper collar still survives, but the wearer of today knows little of its past glories and its first bid for popular acceptance. Its present existence is more prosaic and not as widely and as ingeniously heralded as in the heyday of its inception.

Enclosed Gear Drives . . .

(Continued from page 371)

sion, and appears as a series of radial lines, as clearly illustrated in Figure 8. This condition will become evident in a very short period of time, progressing rapidly to ultimate failure unless remedied. Approximate amounts of lubricant are usually clearly specified on unit nameplates by the gearing manufacturer, and one of several devices used to indicate correct oil level. Providing the correct initial amount of lubricant is extremely important and a check for correct level should be included in each periodic inspection. Such checks should be made only when the unit is not running in order to insure that the oil level is not higher than that indicated as correct for the drive. Also, a small quantity may be added if found necessary, to bring the level to the proper point.

An excellent item of preventive maintenance is to drain and filter the oil in the gear drive approximately one month after it is placed in service, rather than refiling to the specified oil level. This removes any foreign material which may have been present or collected in the lubricant in initial operation. Do not fill the gear unit beyond the indicated oil level. Excess lubricant increases the "churning" effect, and will result in overheating. This will cause thinning of the oil and probable destruction of the oil film on the gear teeth.

A breather is usually provided on enclosed gear drives for the express purpose of equalizing the pressure inside the unit and the surrounding atmosphere. Checking to make sure it has not become clogged should be a part of each periodic inspection; and more frequently, if the unit is operating in a dusty atmosphere. Such breathers are simply constructed and easily maintained as can be seen in Figure 9.

Following of the simple rules given is an extremely important factor in keeping your gear drives on continuous trouble-free duty during peak production period of the war, and an equal assurance of drives in first class condition for the postwar era.

"The Businessman's Bureau"

▶▶▶ HOW WELL DO YOU KNOW the organization and function of the Bureau of Foreign and Domestic Commerce?

You may say, "Well enough," or possibly, "What is there about the Bureau that it should be brought up this way?"

Whatever may be your idea, if you are interested in your own welfare, the success of your firm and industry, the advancement of your community, and the progressive development of your country—and who shouldn't be interested in these things—you probably need to know more about this agency of our Government than you do.

The Bureau came into being because of the promotional efforts of a small group of businessmen. These men, all engaged in foreign trade, visioned a need for a governmental agency that would serve American business with information, advice, and guidance and to make its wants known to other governmental bodies.

They presented their idea to Congress and the outcome was an Act of Congress, dated August 23, 1912, that brought the department into being.

The statutory functions of the Bureau as set forth by Congress are: "To foster, promote, and develop the foreign and domestic commerce of the United States." Such functions are forthright, also far reaching.

In carrying out its duties, the Bureau has gathered and continued to gather facts and statistics of interest and of value to business. Evaluated, interpreted, and analyzed for easy understanding by businessmen, these data constitute a most extensive literature on a wide variety of business subjects.

The Bureau also serves as the voice of the businessman in Government. It weighs and studies the problems and requirements of businessmen; and then presents the findings to proper governmental authorities.

There are many other services of the Bureau. In fact, it would be difficult to catalogue all of its ramifications.

However, to get a better understanding of the available aids of the Bureau, get a copy of *The Businessman's Bureau*, a recent publication of the U. S. Department of Commerce if you do not already have one, and read it. (Write the Department of Commerce, Washington, D. C., or its field office nearest you for a copy. It will be furnished by the respective office upon request.) The publication presents a comprehensive story of the organization and functioning of the Bureau of Foreign and Domestic Commerce. You will find the story interesting and profitable.

The Isolation and Analysis of Hemicellulose Fractions From Aspen Holocellulose*

BERWYN B. THOMAS[1]
The Institute of Paper Chemistry

▶▶▶ THE SUBDIVISION OF plant materials into their chemical components and the further study of these fractions began just over a century ago with Payen's separation of cellulose and an unidentified substance which was later named "lignin." The third major fraction was not discovered until over fifty years later, when, in 1891, Schulze detected what he called "hemicelluloses" and defined them as those polysaccharidic components of plant tissue which are extractable by dilute alkalies after removal of the water-soluble materials, and which are relatively easily hydrolyzed by dilute acids. The name and the definition, unfortunately, are both inaccurate; the soluble fractions include two quite distinct types of compounds. In Norman's (*1*) nomenclature these are the "cellulosans," which are short pentosan or hexosan chains woven into the cellulose micellar structure, and the "polyuronides," which contain relatively larger amounts of uronic acid and are apparently associated with the lignin in the middle lamella. Further confusion results from the tendency of portions of these materials to remain insoluble in dilute alkalies until the lignin has been removed, and of other portions to disperse in water alone after delignification. Therefore, it is not surprising that, even after fifty years work by many investigators on hemicelluloses from many sources, information on their structure, occurrence, and function is far from complete and often conflicting.

Two general methods may be employed for the extraction of hemicelluloses from plant materials. The older and simpler of these is the one on which Schulze's definition was based, namely, direct extraction from the plant tissue with dilute alkali after removal of the extractives. The extracted hemicelluloses are precipitated, purified, and fractionated in various ways. This method has been developed and widely applied by many investigators whose work is well summarized by Norman (*1-3*). The outstanding difficulty of the direct approach is that a large part of the hemicellulose cannot be extracted by dilute caustic except after the removal of the lignin. Furthermore, a part of the lignin, which is simultaneously removed, interferes with the isolation of the hemicellulose.

The second general method has been available for satisfactory use for only about ten years. It depends on the initial treatment of the extractive-free wood with some form of active chlorine and suitable solvents to remove the lignin, after which the hemicelluloses may be extracted. By proper choice of chlorinating agent and solvent, a procedure has been sought for the complete removal of the lignin with a minimum loss of polysaccharides. The hemicelluloses in the residue from such a treatment (which is known as "holocellulose") must be defined as those components extracted by water *or* alkali of concentrations up to 17.5 per cent (as NaOH), the final remainder being termed arbitrarily "alpha-cellulose." The hemicelluloses are believed to be essentially unchanged by the delignification procedure and are more easily removed, in as many fractions as may be desired, than is possible by the older method.

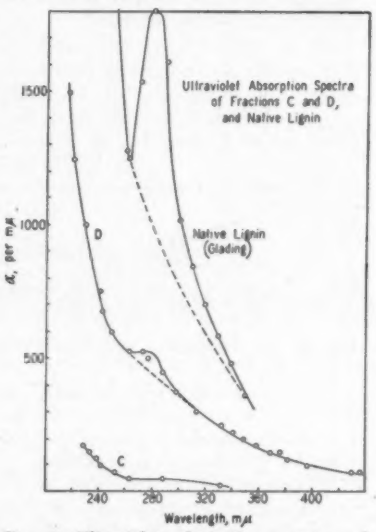

Fig. 1—Ultraviolet absorption spectra of Fractions C and D, and of native lignin

The method of holocellulose preparation most frequently employed in recent years has been that of Van Beckum and Ritter (*4*), in which the wood meal is chlorinated with gaseous chlorine and then extracted with a hot alcoholic solution of monoethanolamine. High yields of holocellulose have been obtained and the method is rapid and convenient. In the case of extracted woods, the percentage of lignin plus the percentage of holocellulose accounts for nearly 100 per cent of the wood. However, it is probable that there are at least two errors in preparations made by this method: The water-washing required after each treatment may extract a portion of the more easily soluble polysaccharides; and it has been reported by Atchison (*5*) that monoethanolamine forms a complex with lignin which is soluble in sulphuric acid. Thus there may be lignin remaining in the final holocellulose, not detectable by analysis, which may balance the loss of a small amount of hemicellulose. It has also been shown (*5-7*) that it is not possible to prepare holocellulose by the method of Van Beckum and Ritter in samples of more than a few grams, without serious loss through the degradation of the carbohydrate during the chlorination.

For the purpose of reducing the degradation and loss, a modification of the holocellulose procedure was devised in the present investigation. This modified procedure already has been described (*8*). The initial chlorinations were carried out in a cold carbon tetrachloride medium, the extractions being made according to the method of Van Beckum and Ritter except that the use of water was kept at a minimum. Significant quantities of water-soluble carbohydrates were recovered from such aqueous solutions. By this process samples up to 350 grams of aspen wood meal were handled easily, and larger ones could have been prepared if suitable equipment had been available. The yield of holocellulose obtained ("lignin-free") was 77.5 per cent; a water-soluble polysaccharide amounting to another 1.4 per cent of the wood was recovered by alcohol precipitation from the water used in preparation of the holocellulose. As

*A portion of a thesis submitted in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Doctor of Philosophy from Lawrence College, Appleton, Wisconsin, March, 1944. This work was carried out under the direction of Louis E. Wise.

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previously outlined, these two products accounted for 80 per cent of the acetyl groups of the wood and 97-98 per cent of the xylan and carbon dioxide. Mannan and galactan were not found in the aspenwood. The lignin content of the wood was 18.9 per cent; the total wood accounted for was, therefore, 97.8 per cent. Residual lignin detected in the holocellulose was 0.4 per cent, and the product had a very faint cream color.

In comparison with the amount of work which has been done on hemicelluloses isolated directly from the wood, the investigation of extracts from holocellulose has hardly begun. Mitchell and Ritter (*9*) prepared maple holocellulose and fractionated it by extracting with boiling water, 2 per cent sodium carbonate, 4 per cent sodium hydroxide, and boiling 10 per cent sodium hydroxide. The first fraction was separated into two subfractions by precipitation with alcohol and acetone, respectively, whereas the other three fractions were precipitated with alcohol and purified by dissolving in water, acidifying with hydrochloric acid, and reprecipitating with alcohol and acetone. The fractions were analyzed for their constituent groups, and, by means of iodine number determinations, average molecular weights were estimated. On this basis hypothetical average structures for the fractions were formulated, in which each fraction was considered as being made up of units containing the necessary numbers of the constituent groups to correspond with the analytical data. In the calculation, the sum of uronic anhydride, methoxyl, acetyl, and xylan [the last adjusted for "uronic acid-furfural" by the method of Lefèvre and Tollens (*10*)] was subtracted from 100 per cent. The difference was termed "hexosan." The fractions extracted by water were thereby shown to contain about 25 per cent hexosan, the alkali extracts only 6-7 per cent. Such a calculation by difference is an arbitrary one, because any error in other parts of the analysis is thrown into this fraction.

Table I—Preliminary Fractionation of Holocellulose

Extracting Agent	Number of Times Applied	Hours for Each Extraction	Yield (ash-free), (per cent)
Water, 20° C.	3	12	3.9
Water, 100° C.	3	4	5.1* 4.0**
$KHCO_3$, 5%	3	8	0.6
K_2CO_3, 5%	2	6	1.6
KOH, 1.4%	2	3	1.3
KOH, 5.6%	2	1.5	10.3
KOH, 13.9%	2	1	6.3
KOH, 23.8%	1	0.5	1.1
Residue (substantially alpha-cellulose)			65.0
Total accounted for			99.7

*Fraction precipitated by alcohol
**Fraction soluble in alcohol, recovered by evaporation

A similar preparation of holocellulose by the method of Van Beckum and Ritter was made on aspenwood by Millett (*11*). The very low yield of 55 per cent was ascribed to losses in handling the many small batches prepared. This product was fractionated with hot water, 1 per cent sodium hydroxide, and 5 per cent sodium hydroxide, and the fractions purified by the method used by Mitchell and Ritter. The average molecular weights of the fractions were determined by several methods, including osmotic pressure, equilibrium centrifuge, viscosity, molecular diffusion, and iodine number. Millett concluded that the molecular weight of the material was nearly constant through the three fractions, and that the differences in solubility must be caused by differences in structural arrangement. This conclusion was apparently based on molecular weights determined by viscosity, the result by this method being 8,000 for each of the three fractions. The data obtained from iodine number tests, however, gave molecular weights of 2,000, 4,000, and 10,000, respectively, for the three fractions, which were quite similar to the results of Mitchell and Ritter. Molecular weights obtained on the first fraction by the other methods ranged from 7,400 to 12,500.

The Fractionation of Aspen Holocellulose

In the present investigation, some revisions of the extraction methods previously used were considered necessary. First it appeared that, if a considerable amount of water-soluble polysaccharide was removed by the small amount of water used in the preparation of the holocellulose, an actual cold water extraction would probably remove a significant fraction before the application of hot water. Second, to make the fractionation as sharp as possible, each extraction should be repeated, similar extracts being combined. Third, in keeping with the definition of hemicelluloses in holocellulose, the extraction must be continued to remove all components soluble in 17.5 per cent sodium hydroxide, the residue being very nearly equivalent to alpha-cellulose. Fourth, potassium rather than sodium bases should be used because their removal was easier. (There are no suitable sodium salts appreciably soluble in alcohol, but potassium acetate is highly soluble in this solvent; thus, the salts formed on neutralization might be removed and the hemicellulose precipitated at the same time.)

A preliminary series of extractions was carried out on samples of about 15 grams of holocellulose. The ex-

Table II—Yield and Analysis of Holocellulose Fractions

Fraction Holocellulose	Total Yield, g. 450 +8.5*	Ash, (per cent) 0.20	Total Ash-free, g. 457	Yield, (per cent) 100.0	Nitrogen, (per cent) 0.57	Acetyl, (per cent) 3.37	Methoxyl, (per cent) 0.88	CO_2, (per cent) 1.34	Molar Ratio MeO: CO_2 X:1 0.93	Uronic Anhydride, (per cent) 5.4	Xylan, (per cent) 20.1	Glucosan, (per cent) 65.2**	Total Accounted for, (per cent) 95
A	8.54	0.90	7.95	1.74	1.02	1.72	1.89	8.14	0.33	32.6	50.0	8.	94
B	15.64	4.75	14.90	3.26	0.83	8.91	2.34	4.28	0.77	17.1	57.3	5.0	90
C	19.41	1.15	19.19	4.20	0.83	8.12	2.48	5.86	0.60	23.4	54.2	5.5	93
D	12.02	1.71	11.79	2.58	8.46	8.94	2.40	3.02	1.13	12.1	8.0	7.5	46
E	56.3	8.34	51.7	11.3	0.25	†	1.70	3.64	0.66	14.6	82.7	8.6	107
F	29.92	16.43	25.30	5.54	0.13	.....	1.70	2.75	0.88	11.0	85.5	7.9	105
Alpha-cellulose	298	0.00	298	65.3	0.09	0.00	0.15	Trace	.....	<0.5	1.58	.....	.....
Total yield recovered, per cent.....				93.9									

*The A fraction was considered as part of the holocellulose in calculating yields. Analyses given for holocellulose are on the product as isolated—i.e., exclusive of Fraction A.
**Obtained by subtracting nonglucose constituents from alpha-cellulose residue
†Residue after hot water extraction (88 per cent of holocellulose) contained 2.09 per cent acetyl

Table III—Material Balances on Constituent Groups in Holocellulose*

	Acetyl	Methoxyl	Carbon Dioxide†	Xylan
Fraction B	0.29	0.08	0.14	1.8
Fraction C	0.34	0.11	0.14	2.3
Fraction D	0.23	0.06	0.25	0.2
Water-extracted residue	1.84	.....	.....	.....
Fraction E	.....	0.23	0.41	9.3
Fraction F	.....	0.09	0.15	4.8
Alpha-cellulose	0.00	0.10	Trace	1.0
Total	2.70	0.67	1.09	19.4
Holocellulose	3.37	0.88	1.34	20.1
Percentage accounted for	80	76	81	97

*Based on 100 grams ash-free holocellulose. (Fraction A is not part of the holocellulose as isolated and, therefore, is not included in this summation.)
†Carbon dioxide multiplied by four gives yield of uronic anhydride.

tracting conditions and yield of each fraction are shown in Table I. The potassium hydroxide solutions used were the molar equivalents of 1, 4, 10, and 17.5 per cent sodium hydroxide. The alkaline solutions were neutralized immediately with acetic acid, and each was concentrated under reduced pressure at 45 to 65 C. The concentrates were poured into several volumes of 90 per cent alcohol, and the precipitated carbohydrates collected and washed by centrifuging.

During the extraction with hot water, the mixture became red brown in color, but the precipitated hemicellulose was white. The dark-colored alcoholic filtrate was therefore evaporated to dryness, and a dark brown amorphous powder was obtained which was set aside as a separate fraction.

That the final residue (after extraction with 23.8 per cent potassium hydroxide) was quite comparable with alpha-cellulose was shown by *direct* alpha determination on the holocellulose. Using 17.5 per cent sodium hydroxide, the result was 51.3 per cent alpha-cellulose on the wood basis. Using the equivalent 23.8 per cent potassium hydroxide, the yield was 52.1 per cent. The residue remaining after the various extraction procedures was 50.5 per cent (on the wood basis).

Following these preliminary experiments, a procedure was devised for the extraction of hemicelluloses from one pound of holocellulose. Those extractions which had produced less than 2 per cent of product were omitted, and the two remaining alkaline extracting solutions were changed to 5 and 15 per cent potassium hydroxide for the sake of simplicity. The extractions were carried out in a nitrogen atmosphere. The schedule adopted was as follows:

1) Cold water, 20 C., applied three times for 12 hours each. Extract designated "Fraction B."

2) Hot water, 90-95 C., three times for four hours each. Alcohol-precipitated extract designated "Fraction C"; alcohol-soluble extract, recovered by evaporation, "Fraction D."

3) Potassium hydroxide, 5 per cent, twice for two hours each. "Fraction E."

4) Potassium hydroxide, 15 per cent, twice for one hour each. "Fraction F."

The water extracts were treated with very small amounts of Dowicide G to prevent attack of microorganisms.

In addition, the material extracted by cold water during the course of the holocellulose isolation was included as "Fraction A." This fraction was purified from lignin residues precipitated with it by redissolving in water, brominating by the method of Anderson (*12*), and precipitating into hot alcoholic monoethanolamine. It was then redissolved in water, filtered, and poured into 90 per cent alcohol. The flocculent white precipitate was collected by centrifuging, washed with alcohol and ether, air-dried, and ground to pass an 80-mesh screen. Stored in a tightly capped bottle, it did not show troublesome hygroscopicity.

The extractions were carried out in a 5-gallon bottle, fitted with a motor-driven agitator and a tight cover with an inlet through which nitrogen was supplied to exclude oxygen as far as possible. The amount of material to be removed by each treatment was estimated, and the volumes of extracting solutions applied were calculated to give an approximately constant consistency of 3 per cent. The holocellulose was filtered from each mixture through a 120-mesh stainless-steel wire cloth fitted to a 12- inch Büchner funnel, and the filtrates were refiltered through glass cloth.

The faintly opalescent cold-water extract (B) was concentrated under reduced pressure and then poured into several volumes of alcohol. The precipitated hemicellulose was filtered on a piece of mercerized broadcloth, purified by boiling with alcohol, and washed with alcohol and ether. It was air-dried, ground, and stored in a tightly capped bottle.

During the hot water extractions the *p*H was maintained at 6-7 by the addition of 0.1 per cent of ammonium acetate and small amounts of ammonia. The solution obtained was brown in color, but (as in the preliminary test) a white precipitate was formed when treated with alcohol. This extract (C) was purified in the same manner as that obtained with cold water. Treatment of the filtrate with acetone did not give good precipitation; therefore, the entire mixture was evaporated to dryness and the residue was powdered and retained as a separate fraction (D). This fraction was the only one to show a slight hygroscopicity.

The neutralized alkaline extracts were also concentrated under reduced pressure and were poured slowly into several volumes of hot 90 per cent alcohol. The precipitates were very gelatinous and had to be separated by centrifuging. The thick jelly obtained was boiled with alcohol several times, until the gel was dehydrated and until as much as possible of the occluded salt was dissolved out. The hemicelluloses were finally reduced to fine white powders containing a residue of ash which could not be removed by further boiling with alcohol.

The final fibrous residue, approximating alpha-cellulose, was washed with dilute acetic acid and water. It was pure white and more finely divided than the holocellulose, a possible indication that the portions of single cells in each grain of wood meal had been held together by the hemicelluloses and traces of residual lignin from the middle lamella.

Some mechanical losses occurred in handling the fractions through the repeated alcohol boilings. Despite this, the yields of the various fractions, calculated to the ash-free basis, accounted for 94 per cent of the holocellulose.

Analysis of the Fractions

The original weight of holocellulose taken for extraction was 449 grams on the ovendry, ash-free basis (67 per cent of the total holocellulose prepared). In addition, 67 per cent of Fraction A, or 8.0 grams, were accredited to the holocellulose used for the extractions, and the yields of all fractions were based on a total of 457 grams of ovendry, ash-free starting material. This addition was made because Fraction A, being a carbohydrate soluble in water *after* the removal of the wood extractives and the lignin, is properly a part of the holocellulose.

The fractions thus isolated were

analyzed for their principal component groups. Wherever possible, the appropriate methods of The Institute of Paper Chemistry were used. Table II gives the yields and average analyses of all the fractions and Table III the material balances for the more important constituents.

Ash

The ash contents of the fractions extracted from the holocellulose by water accounted approximately for that originally present in the wood and holocellulose. The very high ash contents of the alkali-extracted fractions, however, were traced to impurities picked up in the extraction process (chiefly oxalates for which positive tests were obtained; potassium oxalate is not soluble in alcohol). Purification by treatment with water had been omitted deliberately in the case of all the fractions extracted from the holocellulose in order to avoid any possible losses of carbohydrate, but it was found later that extraction with water and careful reprecipitation with alcohol removed most of the ash from Fractions E and F and without very appreciable loss of carbohydrate material. Most of the ash was present as potassium carbonate, but spectrographic analysis showed that smaller amounts of calcium and magnesium were also present. Some evidence indicated that at least a part of the uronic acids of these fractions was in the form of potassium salts. The ash contents determined on the two fractions were adjusted in accordance with these findings to account for the probable preignition form of the inorganic components. The resulting figures, shown in Table II, were used for computing sample weights to the ash-free basis.

Nitrogen

Nearly all the fractions of the holocellulose showed relatively high nitrogen contents as compared with the 0.15 per cent nitrogen in the original wood. This increase was presumbly due to the retention of the monoethanolamine (or ammonium salts) formed during the delignification. The largest part of this residual nitrogen appeared in Fraction D. The evolution of ammonia upon heating with alkali showed that at least part of this fraction was a residue from the ammonium acetate buffer used during the extraction. However, analysis of the similar fractions from the preliminary series of extractions (in which no buffer had been used) showed that the alcohol-soluble material contained six times as much nitrogen as the alcohol precipitate. After the removal of the hot-water extract the holocellulose was white and the nitrogen contents of the alkali extracts were much lower.

Acetyl Groups

Acetyl analyses were made only on the water extracts, because the treatment with strong caustic saponified the acetyl groups remaining after the hot-water extraction. A sample of the fibrous residue after the cold and hot water extractions still retained 2.09 per cent acetyl. The total recovery of acetyl groups on all fractions was equal to 80 per cent of the acetyl of the holocellulose. Considering the sensitivity of this group to loss under alkaline conditions, the recovery is believed to be satisfactory. As in the nitrogen analysis, a comparison was made with the hot-water fractions of the preliminary tests, to determine whether the use of the ammonium acetate buffer had affected the results; no definite evidence was found that it had.

Methoxyl Values

The fairly high methoxyl contents of the water-soluble fractions were probably partly due to traces of residual lignin. The greater part may well have been due to methoxyuronic acid groups (although this point was never proved). Fractions E and F showed much less methoxyl. Summative analysis of the methoxyl accounted for only 76 per cent of that found in the holocellulose. The methoxyl contents as reported were calculated as percentage $-OCH_3$ but when the methoxyl was added into the summation of each fraction it was calculated as percentage $H_2C=$, because the substitution of a methoxyl group into a sugar or uronic acid molecule replaced a hydroxyl group, and thus one H and one O atom must be substracted.

Uronic Acid Groups

The uronic acid content of Fraction A (32.6 per cent) is higher than any reported in the literature for a similar material other than pectic substances. The concentration of uronic acids in the most easily soluble fractions is in harmony with the usual concept of hemicellulose structure and behavior. The trend of values through the various fractions resembles that found for maple holocellulose by Mitchell and Ritter (*9*). The alphacellulose, when subjected to uronic acid analyses, produced a very small steady evolution of carbon dioxide, but not more than could result from the cellulose itself, according to the data of Whistler, Martin, and Harris (*13*). About 81 per cent of the carbon dioxide evolved from the holocellulose was accounted for summatively in the various fractions.

Inasmuch as several investigators have reported the presence of a methoxyhexuronic acid in certain hemicellulosic products, the ratio of methoxyl to uronic acid groups is shown in Table II for the various fractions.

The only one in which the molar ratio exceeded unity was Fraction D, which was believed to contain excess methoxyl because of lignin residues. It would appear, therefore, that if a methoxyhexuronic acid is present in the fractions here obtained, there are also other uronic acid residues having no methoxyl groups.

Xylans

The absence of galactose in the aspenwood made the presence of any arabinose highly improbable. Therefore, the data obtained on analysis for pentosans (by phloroglucinol precipitation) were calculated directly to xylan, correcting for furfural from the uronic acids, by the formula of Angell, Norris, and Resch (*14*):

$$X = 0.7859\ P - 1.146\ C + 0.0060 \pm 0.0006$$

where X = weight of anhydroxylose, or xylan*,
P = weight of furfural phloroglucide precipitated, and
C = weigh of carbon dioxide evolved from glucuronic acid present in the sample, as determined by separate analysis.

With exception of Fraction D, the xylan contents of the water-extracted fractions were nearly constant at about 50 per cent, even though the uronic acid contents varied quite widely. In the alkali-extracted fractions, the xylan contents were much higher, indicating that these extracts contained relatively greater amounts of cellulosan and less polyuronide. The xylan balance in Table III shows an almost total recovery of the xylan in the holocellulose.

Glucosan

Galactan and mannon being absent, glucosan was the only hexosan for which tests were made. Methods for the determination of glucose are far less precise than those for the other sugars, because glucose has no reactions sufficiently distinctive to separate it

*Another formula for the correction of pentosan precipitates for the furfural produced from uronic acids was published in 1907 by Lefèvre and Tollens[2]. Norman[1] has stated that this method gives results which are too high. However, in the appendix to his book[1] (page 222) he erroneously gives the above formula of Angell, Norris, and Resch for anhydroxylose as being the formula for xylose itself. Since xylan weighs only 88 per cent as much as the equivalent xylose, such a calculation would indeed give somewhat lower results.

Table IV—Glucosan Contents of Hemicellulose Fractions Determined by Fermentation

Fraction	A	B	C	D	E	F
Fermentations with N.R.R.L. No. 379						
Number of tests	4	7	6	3	5	4
Lowest percentage glucosan	5.6	4.0	4.4	6.3	6.1	7.6
Highest percentage glucosan	11.5	7.2	6.8	8.1	11.3	8.6
Mean value	8.4	5.8	5.5	7.1	8.6	8.2
Average deviation from mean (%)	31	17	20	10	26	4
Fermentations with N.R.R.L. No. 966						
Number of tests	5	7	5	2	6	5
Lowest percentage glucosan	2.9	3.1	5.0	8.0	7.8	6.4
Highest percentage glucosan	10.1	5.5	5.8	8.0	10.7	8.6
Mean value	6.7	4.2	5.4	8.0	8.5	7.7
Average deviation from mean (%)	40	19	6	0	9	8
Average of all tests (%)	8	5.0	5.5	7.5	8.6	7.9

quantitatively from the others. Its presence has been detected in hemicellulose hydrolyzates by the formation of glucosazone (which would also be given by mannose and fructose) and by the fermentability of the solutions. A quantitative determination of glucose, measured by the change of reducing value upon fermentation, was reported by Jahn (*15*). A similar method was used in the present work.

One-gram samples of each hemicellulose fraction were hydrolyzed with 175 ml. of 2 per cent sulphuric acid for the time required to give the maximum reducing value, which was predetermined by means of hydroylsis-time studies. The hydrolyzates were then neutralized to *p*H 5 with solid sodium carbonate, adjusted to a volume of 200 ml., and filtered through two dry hardened filter papers. Aliquots of 25 ml. were taken from the undiluted filtrates and their reducing values determined. Other aliquots of the same size were fermented by the method of Wise and Appling (*16*), using on separate samples the two organisms *Saccharomycetes carlsbergenis* (N.R.R.L. No. 379) and *S. bayanus* (N.R.R.L. No. 966). Both of these ferment *d*-glucose readily, whereas only No. 379 will ferment galactose. At the end of 48 hours of incubation, the samples were adjusted to 50 ml. and filtered through dry Celite filters. Aliquots of 40 ml., representing 20 ml. of the original hydrolyzate, were taken from the filtrates for the residual reducing sugar determinations. The differences in yield of cuprous oxide between the fermented and unfermented samples were converted to glucose by the Munson and Walker tables (*17*), and calculated to percentage of glucosan. It was found in making these residual sugar determinations that the colloidal yeast debris in the solution sometimes gave trouble in filtering the cuprous oxide, but that Gooch crucibles so clogged could be quickly cleared by a brief washing with briskly boiling water.

The determination carried out in this manner is at best a rough approximation. The reproducibility is far from satisfactory when small amounts of glucose are involved. Some of the results are shown in Table IV, together with calculated average deviations from the mean value obtained with each of the fermenting organisms. Control tests, however, showed that the yeasts fermented pure glucose quantitatively, and that the reducing value of glucose as determined agreed with the Munson-Walker table. The greatest variation appeared in Fraction A. This, being the most easily soluble of the fractions and having the highest uronic acid content, may have been sensitive to some type of degradation during the hydrolysis. It is evident, however, that the apparent glucosan contents of these hemicelluloses are all low and within a rather narrow range. Within the limits of the procedure, the two yeasts attacked the hydrolyzates approximately equally, a further evidence of the absence of galactose (a sugar which is not fermented by N.R.R.L. No. 966) (*16*).

After the hydrolysis all the fractions yielded a small amount of insoluble substance. When filtered off this was found to be 1-3 per cent of the initial fraction, and could not be traced to any definite source. An exception was the residue obtained from the dark Fraction D, which amounted to 5 per cent of the fraction and which was recovered as a fine powder similar to the residue from a lignin determination.

Fraction D represented a product not previously reported in studies of this type. Its color, its odor when heated, the residue obtained on hydrolysis, and the failure of all other tests to account for more than half of its weight (Table II) indicated that it was composed largely of some substance other than a polysaccharide. It was believed to be a lignin-monoethanolamine complex, so degraded as to be soluble in 72 per cent sulphuric acid and to have lost many of the characteristics of lignin. A standard lignin determination showed only 2.3 per cent of insoluble material in this fraction, although the more dilute acid of the glucosan hydrolysis left 5.2 per cent insoluble. Mäule color reaction tests on the fraction itself and the residue from hydrolysis and lignin determination were all indefinite and failed to show the characteristic violet of hardwood lignins.

In a search for more definite information on the quantity of ligneous material present, the ultraviolet absorption spectra of Fraction C and D were determined. Glading (*18*) has determined the absorption spectra of native lignin and some of its derivatives, and found that many of these have a common absorption maximum at about 280 mmu and a minimum near 260 mmu. Figure 1 shows a comparison of the spectra of the hemicelluloses and Glading's data.

The curve obtained on Fraction C was typical of curves found on many other carbohydrate materials (*19*). That of Fraction D, however, was much higher and showed a small but definite inflection in the region of 280 mmu. The height of the actual curve above the background curve (dotted line) was about one-eighth the similar difference for Glading's curve, but the trend of the background curve itself was 40-50 per cent as high as the Glading curve. If the hypothesis is accepted that the decreased maximum at 280 mmu is caused by the same degration that had affected the other properties of "lignin" in the D fraction, the estimated value of 40-50 per cent would correspond well with the proportion of the fraction not detected by other analyses. Pure monoethanolamine gave no absorption spectrum, and tannin materials, which might have given similar curves could not have been present in appreciable amounts in any holocellulose fraction.

The other fractions isolated by water extractions (A, B, and C) were found to be nearly alike. The greatest variation was in the acetyl contents, and the low value of this constituent in Fraction A could easily have been caused by the method of purification. The uronic acid content is highest in these fractions, in conformity with the theory of hemicellulose structure, wherein it is supposed that the short-chain pentosan-uronic acid units of the middle lamella are most easily dispersed. Although exact values were not obtained by the glucosan analysis, there was definite indication that this compound was not present in an amount which would be found by the simple

(Concluded on page 382)

Decay and Staining of Southern Pine Pulpwood

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▸▸▸ WHEN A CONSIDERABLE length of time elapses between felling and ultimate consumption of pulpwood, some deterioration can be expected. Under certain conditions, unseasoned and untreated wood stored or in use in the open will become moldy, blue stained, or decayed as a result of the action of fungi. Decay-producing fungi eventually may become evident on the outside of the wood in the form of felts, bracket-shaped structures, mushrooms, etc., and those that cause stain or mold as surface discolorations, moldy growths, or minute dark globular structures. There may be no outside evidence of fungus invasion even though a piece of wood may be badly decayed or stained inside. Losses from decay and discoloration of pulpwood subsequent to felling can be almost completely eliminated if the wood is utilized soon enough after felling. Some mills, however, require a storage period either in the woods or in the mill yard.

Decay

Decay in pulpwood results in loss in weight and structural breakdown of the wood. With the present methods of handling pine pulpwood in the South, where rapid turnover of wood with short storage periods is commonly practiced, decay is probably less of a problem than farther north where the wood storage period is often longer and piling methods are often more conducive to decay. In the manufacture of paper, a certain amount of decayed wood can be used without serious results; however, a large proportion of such wood will result in a comparatively low yield of pulp, and in pulp of inferior quality.

Many tests have been made comparing pulps made from decayed and sound wood. Kress and his co-workers (5) state, "With decayed wood as raw material, mechanical pulp is characterized by low yields, dark color, and to some extent low strength; soda pulp by high consumption of chemicals, low yields, and decidedly low strength. Sulphite pulp, on the other hand, unless made from wood badly deteriorated, has characteristics not greatly different from those of pulp made from sound wood. The yield, when expressed in terms of weight of both wood and sulphite, is not materially lower, although the pulp is slightly darker and becomes somewhat brittle when beaten. When the wood has become badly decayed, however, the deterioration is reflected more positively in the characteristics of the pulp."

Tests with mechanically pulped spruce by Kress and co-workers showed that decayed wood produced 15.8 per cent less pulp than sound wood, computed on the basis of the oven-dry weights of the wood and the pulp produced. Other experiments (9) have shown decreases up to 10 per cent in yield of sulphite pulp from decayed wood, and a higher bleach requirement. The extent to which the yield and quality of pulp are affected by decayed wood depends upon the fungi causing the decay, how badly the wood is decayed, and the kind of wood and pulping processes used. The sapwood of the southern pines is not decay-resistant.

Climatic conditions in the Southeast are more favorable to decay than in the North because of the higher temperatures prevailing and the somewhat higher rainfall. Except during short periods of cold weather, decay can continue actively throughout the year, while in the North decay progresses slowly if at all during the winter months. In order to avoid decay losses, it is therefore necessary that the storage period in the South be kept as short as possible. The decay rate ordinarily is slower in winter, and therefore the loss from decay is less during that period than in summer.

Extensive decay has been observed in unbarked pine pulpwood stacked in long, high, poorly aerated ricks for about six months from spring to fall along the Mid-Atlantic coast (Figure 1). Wood stored the same length of time from fall to spring would have become much less decayed. Where it is necessary to build up a reserve supply to tide over the winter season in this region, it would be best to start the accumulation not earlier than September and later if possible, and to use the wood by the early part of the following spring. It is probable that the decay problem will be unimportant if storage covers only a few months during this period.

Pulpwood is subject to decay while on the stump, stored in the woods, in transit, and stored at the mill. The decay occurring in living trees is limited to the heartwood. The amount of heart rot in the relatively young southern pine commonly used for pulpwood is small and ordinarily need not be considered. The reduction of

Fig. 1—Poorly ricked wood at a southern mill that developed extensive decay in a single spring and summer. Note several contiguous high ricks with no space left between them. (U. S. Forest Service, Appalachian Forest Experiment Station photo)

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Fig. 2—A heavy pulpwood cutting, showing a good type of penning wood for seasoning in the woods. (U. S. Forest Service, Appalachian Forest Experiment Station photo)

amount of heart rot in timber stands is a forest management of excessively long rotation, and discrimination against defective trees in silvi-cultural operations.

Where pulpwood is to be stored in the woods for a period of several months, the best practice from the standpoint of avoiding serious decay is to pile it so as to leave a maximum of air circulation around the bolts, and so that water will drain off readily. The more rapid the rate of drying the less decay will develop. Ricking the wood, with the ricks separated several feet from each other and kept off the ground by stringers, or preferably piling in pens, as shown in Figures 2 and 4, rather than close piling, will result in more rapid drying and consequently less decay. Setting up a series of ricks against each other not only results in poor circulation but also permits the ready spread of decay from one rick to the other. If possible the wood should be piled in open space on ground that drains well, exposed to the sun, rather than under trees.

The decay hazard is lessened by peeling as peeled wood seasons more rapidly than unpeeled wood.

Under ordinary circumstances very little decay will take place while the wood is in transit. However, where wet or green wood is allowed to remain closely stacked in freight cars or on barges for periods of several weeks in warm weather, decay may become established and eventually cause appreciable loss. Under such conditions the spread of decay from bolt to bolt is especially favored.

The recommended storage practice at the mill is to pile the wood in separated ricks. The best and most certain way to avoid decay is to keep as small a supply of wood in the yards as possible and to keep using this, replacing it with fresh wood. Fresh wood should not be stacked on top of old wood. By recording the date of cutting on each pile or rick a proper rotation can be followed. Well-spaced ricks are preferable to conical piles, because in the latter, wood and bark fragments and other debris become massed in the middle and lower parts of the piles, and the mass becomes soaked by rain or watering, resulting in excellent conditions for rapid extensive decay. Conical piles are also subpect to considerable decay because they are erected directly on the ground, and because they afford little air circulation through the piles. Figure 3 shows excellent yard storage, which could be improved only by the use of rail stringers against the ground and higher stacking for more economical use of space.

Proper yard sanitation is one of the important factors in avoiding unnecessarily heavy decay losses. The yard should be well-drained, so that water does not stand after rains. It should preferably be cindered. All debris should be removed after a pile or rick has been dismantled, because piles of bark and wood fragments are breeding places for decay fungi. The growth of weeds around stacked wood should be discouraged. The above recommended storage practices for southern pine pulpwood are in agreement with those suggested by Richard (*8*) for pulpwood in general.

Blue Stain

Up to the present time, southern pine pulpwood has gone largely into the manufacture of kraft paper, board, and in some cases high-grade white paper. Wood used in the manufacture of the first two products unless heavily stained, does not result in appreciably darkened pulp, and in the case of high-grade white paper the color is bleached out. Stained wood requires more bleach than bright wood, but this has not proved a serious handicap under ordinary stain conditions. On the stain aspects of the use of southern pine for newsprint, Curran and Behre (*2*) p. 19, state, "Experiments have definitely proved that a moderate amount of blue stain is not harmful, but on the contrary actually improves the color of groundwood pulp by making the characteristic yellow tint. Sulphite pulps made from blue-stained wood are definitely darker and dirtier than those from unstained material, but here again, if the amount of stain is not excessive the utility of the pulp for newsprint is not seriously affected. However, large quantities of blue stain carry through in both mechanical and sulphite processes and would unquestionably destroy the value of such pulps for newsprint." Chidester and coworkers (*1*) found that blue-stained loblolly and shortleaf pine gave unbleached sulphite pulps that were darker in color, and required as much as 9 per cent more bleach than pulps from unstained wood. Unbleached sulphate pulps from stained wood were also darker and required from 2½ to 5 per cent more bleach than unstained wood. In neither type of pulp was strength nor yield appreciably influenced by blue stain.

Whereas Herty (*4*) reports producing an exceptionally light-colored groundwood pulp with southern pine estimated to have been 25 per cent blue-stained, tests by Chidester and co-workers (*1*) indicated that the brightness of loblolly pine groundwood pulp was noticeably affected when the wood was more than 10 to 15 per cent blue-stained. These somewhat variable results may have been due to different densities of staining in the two cases or to the methods of estimating amount of stain. Both Herty and the Forest Products Laboratory found that high proportions of stained wood produced badly discolored sulphite pulp.

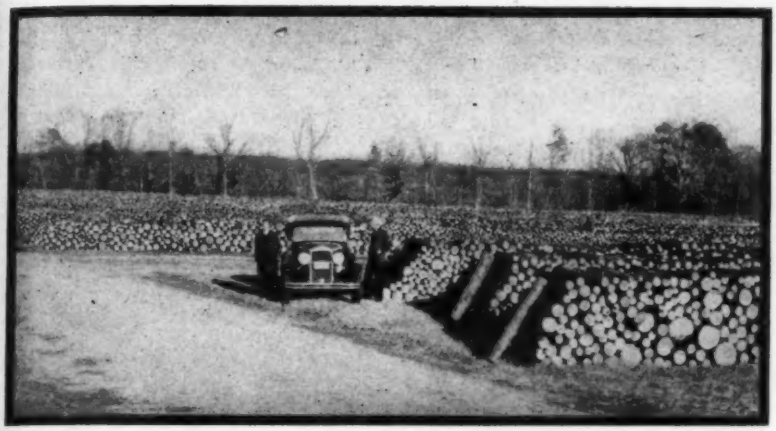

Fig. 3—Well-stacked pulpwood at a river landing (U. S. Forest Service, Forest Products Laboratory photo)

In view of the possible importance of blue stain in pulpwood under some conditions it seemed well to obtain some preliminary information on the extent to which southern pine pulpwood becomes stained when stacked in the woods. Accordingly, observations were made on stain development in peeled shortleaf pine pulpwood cut and penned near Sanford, North Carolina, in August 1934, and on loblolly pine cut and penned near Summerville, South Carolina, in early September, 1934 (Figure 4).

Conditions for drying were better for the loblolly, where the pens were partly in an open field and partly in open woods adjacent to the field, than for the shortleaf, where the pens were in a thinned area of one acre situated in dense woods.

Observations on sapwood volume stained were taken at approximately the end of 1½, 3 and 5½ months. At each of these periods 10 per cent of the penned bolts were split in half. The manner of computing the percentage of sapwood volume stained, and details of the results obtained from these observations are given by Hepting (3). The following discussion summarizes these results.

In both species practically all of the staining took place prior to the first examination (1½ months after felling). At that time 43 per cent of the sapwood volume of the shortleaf and 36 per cent of the loblolly were stained. No conclusions can be drawn from these data as to whether shortleaf stains more readily than loblolly because of the differences in weather conditions at Sanford and Summerville. While the mean temperatures during the first month were almost the same at the two places, the precipitation at Sanford was more than twice that at Summerville. In the shortleaf, 58 per cent of the stain was classified as dark in color, 37 per cent medium, and 5 per cent light. In the loblolly, 38 per cent was classified as dark, 55 per cent medium, and 7 per cent light. These percentages were practically the same at all three periods.

The proportion of sapwood stained, as measured in this study, did not vary appreciably between inside and outside bolts, between layers, or between different types of pens. This may appear to indicate that methods of piling have no effect on blue stain development. Methods of piling, however, have been shown to affect greatly the development of blue stain in lumber through their effect on rate of drying (7). If some of the pulpwood in this study had been bulk-stacked in long ricks or high stacks, in addition to pens, so that the chances for air circulation would have varied considerably between the piling methods, differences in stain occurrence might have been evident between the piling methods. However, in this study the fullest pens apparently allowed almost as good air circulation as the most open because the pens were small and the layers at right angles to each other (Figure 4).

A small-scale test indicated that machine-barked wood developed less blue stain than hand-peeled wood. More tests are needed, however, before it can be known that this is generally true.

The results of this study are indicative only of what might be expected in the species studied under the conditions prevailing during the period the study was made. Wood cut at a different time of year, with different weather conditions during the storage period, might develop very different amounts of stain.

The observations just described were made on peeled wood. The process of blue stain development is so different in peeled and unpeeled wood that data obtained on one cannot be applied to the other. Blue-stain fungi do not infect through the bark, but in unpeeled bolts, are carried through the bark to the wood by bark beetles. Investigations (6) with Norway pine logs showed that unless there was bark beetle attack practically no blue stain developed excepting that which entered at the ends of the logs. The amount of staining of unpeeled wood therefore depends largely upon the extent of bark beetle attack following felling. In the Southeast, from early spring to late fall, these beetles are likely to infest the bark soon after pines have been cut, thereby introducing fungi.

The same conditions that favor decay also favor stain, so that handling practices designed to check one of these processes will tend to lessen the other. The recommendations given for the prevention of decay are also applicable to blue stain. The only sure

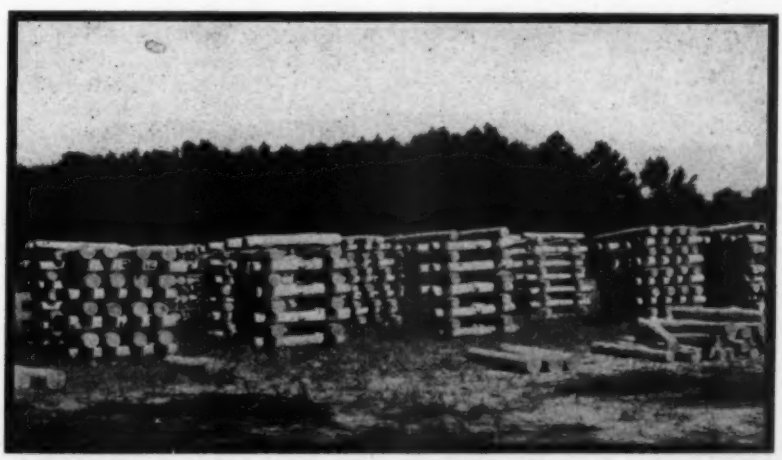

Fig. 4—Different types of experimental pens used in blue stain study. (U. S. Forest Service, Appalachian Forest Experiment Station photo)

way to avoid staining is prompt utilization of wood. If pine pulpwood in the South is not used promptly, blue stain is inevitable. No handling methods will eliminate it entirely. Chemical treatment of peeled wood for stain prevention, as practied with lumber, is a possible means of preventing stain in pulpwood, although it is doubtful whether such treatment would be considered economically practicable at the present time. In the case of unpeeled wood, antistain chemicals would not help much because they do not repel beetles, and these insects would introduce the stain fungi through the bark regardless of the chemical on the outside.

Molds differ from stain in that the discoloration caused is largely limited to the surface of the wood. Ordinarily they require no attention since the discoloration is usually not severe enough to affect noticeably the color of the pulp. Under some conditions, however, southern pine pulpwood becomes almost black on the outside as a result of molds. If wood is piled so that there is good air circulation around the bolts, heavy molding will not ordinarily take place.

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Isolation and Analysis of Hemicellulose Fractions

(Continued from page 378)

calculation of glucosan "by difference." Six to 10 per cent of these fractions remains unaccounted for.

The fractions (E and F) isolated by alkaline extraction showed characteristics similar to those reported in the literature for alkali-extractable hemicellulose fractions in their high xylan and relatively low uronic acid contents. The summation of the analyses on these two fractions showed 107 and 105 per cent, respectively. This excess is not readily explainable, though it is possible that the formula used in calculating xylan is not exactly applicable to these particular mixtures. It is also known that the yeasts, N.R.R.I. Nos. 966 and 379 have a very small destructive action on xylose, which might result in slightly high values for "glucosan."

Summary

Holocellulose, prepared from aspenwood by a method which makes possible the use of large samples, was fractionated with cold and hot water and 5 and 15 per cent potassium hydroxide solutions into a total of seven fractions. Each fraction, including the final residue, was analyzed for ash, nitrogen, acetyl, methoxyl, uronic acids, xylan, and glucosan, the last being done by determining the loss in reducing power on fermentation with two different yeasts. Summative calculations of these results accounted for 94 per cent of the holocellulose and from 90 to 107 per cent of the fractions (with the exception of the dark, hot-water soluble "D"), as well as nearly all the more important constituents as distributed among the fractions. The previously made observation that holocellulose retains a small amount of lignin, apparently held in combination with monoethanolamine and not detectable by a lignin analysis, was studied in some detail and substantially confirmed. This residue is removable with hot water, but only with the simultaneous loss of considerable hemicellulose.

This method of approach to the study of hemicellulosic material permits the examination of an unbroken series of products from the most easily soluble polyuronide to the pure cellulose, and should prove useful for further research.

Acknowledgment—Appreciation is due to Dr. L. E. Wise of The Institute of Paper Chemistry for his guidance and assistance in this work, and to Dr. B. L. Browning and Dr. J. A. Van der Akker for their help with portions of the analytical work.

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Paper SKETCHES . . . . . .

SPECIALLY PREPARED OLEAGINOUS PAPER WAS USED IN THE 1880'S TO WRAP THE STEEL CAPPINGS OF THE LEADEN BULLETS FIRED FROM THE 6.5 MILLIMETER MANNLICHER RIFLE. THIS WRAPPING WAS SAID TO REDUCE WEAR ON THE BARREL AND TO HELP THE BULLET TRAVEL A TRUER COURSE.
THE PAPERMAKERS OF FRANCE, DURING THE 1700'S, WERE AMONG THOSE CALLED UPON TO CONTRIBUTE FUNDS, ONCE A YEAR, TO HELP THE EMPLOYEES OF PRINT SHOPS PROPERLY CELEBRATE ST. JOHN'S AND ST. MARTIN'S DAY.
RECENT NEWSPAPER ITEMS REVEAL THAT A FEW BOMB-CARRYING PAPER BALLOONS HAVE BEEN LAUNCHED AGAINST AMERICA BY THE JAPANESE. THESE BALLOONS ARE STATED TO BE ABOUT 30 FT. IN DIAMETER.
AMERICA
JAPAN
BASSWOOD BARK WAS USED TO MAKE WRAPPING PAPER ABOUT 100 YEARS AGO, BY A PAPER MILL IN FAIRHAVEN, VERMONT.

ALLIED

W. W. HENDERSON & SONS FORM A NEW ORGANIZATION FOR SALES AND SERVICE

A new sales and service organization began operations in the South on May 15th. This new service organization is known as W. W. Henderson & Sons, and it will maintain temporary headquarters in Lufkin, Texas. Henderson & Sons will have the exclusive sales and service on such outstanding equipment, machine clothing, and paper mill supplies as DeZurik Shower Company, Wisconsin Wire Works, Brandon Dryer Felts, E. D. Jones & Sons, Parker Safety Equipment Company, Wood Treating Chemical Company, and others will be added to the list.

W. W. Henderson, who heads the organization, has an experience of thirty years in every phase of pulp and paper mill construction and operation, with some of the largest mills in the South. Associated with him will be his three sons, Wm. W. Jr., J. Audrey, and Richard J., all at present in the Army Air Force. All three of the boys had pulp and paper mill experience in several of the larger mills in Alabama, Georgia, and Texas before going into the Service.

Until the boys return, Mr. Henderson, Sr., will handle the business. Later, each of the boys will be established in one-third of the territory, and from a central office directed by Mr. Henderson, will sell and service the equipment and supplies handled in the mills they will contact regularly.

◆

CLARK MANUFACTURING CO. WILL NOW MARKET PRODUCTS UNDER THE NAME "CLARK"

For 37 years The Clark Manufacturing Company, of Cleveland, has marketed steam and vacuum traps, pressure regulators, separators, and other steam specialties under the name of "Strong Steam Specialties." For this reason, the identity of the Clark company itself has been little known in the paper industry, although the products manufactured by it have been widely distributed.

During the past several months, a change of policy has been developed and put into action last month. This change brings all of the activities of product designing, engineering, manufacturing, sales and distribution under the one roof of The Clark Manufacturing Company. From now on, this company's products will be sold as "Clark Fluid Controls." W. S. Goff, who assumed presidency of the Clark company 18 months ago, announces that the concern henceforth will maintain its individual identity, and that it will deal direct with its distributors and customers on a nation-wide scale. At present, Mr. Goff states that the company is devoting its entire effort to war production. However, present dealers will serve as the nucleus of a much larger distribution system to be gradually expanded in the postwar period.

◆

"THE MESSENGER" IS BACK

The paper industry and its affiliates will be pleased to welcome the return of *The Messenger*, that very fine little company magazine formerly published by The Black-Clawson Company, Hamilton, Ohio.

However, don't expect to receive the prewar *Messenger*. As successful as it was, that format has been retired in favor of a new, modern publication with an entirely new, colorful approach. The new publication will be coming out each month, and it is expected it will more than fill everyone's expectations.

◆

THOMAS M. GILLESPIE NOW HANDLES LOCKPORT FELT IN CHICAGO AREA

A broader service to paper mills in the Midwest is announced by Thomas M. Gillespie, manufacturers' agent with headquarters in Chicago.

For the past 13 years, Mr. Gillespie has had charge of this territory for Pennsylvania Salt Mfg. Co., Philadelphia. A short time ago he established his own business in Chicago as manufacturers' agent for Cheney-Bigelow Wire Works, Springfield, Massachusetts, and DeZurik Shower Company, Sartell, Minnesota.

Mr. Gillespie now has taken on the account of the Lockport Felt Company, Newfane, New York, covering the states of Indiana, Illinois, Iowa, Kansas, Missouri, Minnesota, Wisconsin and Michigan. He follows the connection of Frank Murphy for Lockport in this territory.

◆

▶▶▶ NEW AND LARGER Pacific Coast region offices of Detrex Corporation, Detroit, Michigan, have been established at 318 West Ninth Street, Los Angeles 15, California. This office, which is under the supervision of S. B. Crooks, Pacific Region manager, functions as sales and service headquarters for the Pacific Coast and Rocky Mountain states. In addition to controlling division offices in the territory, the Los Angeles branch supervises all local stocks of degressing solvents and standard metal cleaning machines. Direct customer service for Southern California also is handled from this office.

◆

▶▶▶ THE EXPANSION PROGRAM of Corning Glass Works took another step with the announcement on June 5 that the company had completed negotiations for the purchase of a new plant at Leaside, Ontario, for the manufacture of a complete line of glass baking ware, the first to be made in the Dominion. It is stated that operations will be broadened as rapidly as possible to cover the manufacture of other types of glassware.

ARMY - NAVY "E" AWARDS

Second Star: The Aurora Pump Company, Aurora, Illinois, has received a second renewal of the Army-Navy "E" award.

Fourth Star: The Buffalo Forge Company, Buffalo, New York, the first manufacturer to receive the "E" award for "excellence" in the production of fans, has just been awarded the fourth renewal of its award.

Fifth Star: The Carteret, New Jersey, plant of Foster-Wheeler Corporation, of New York City, has just received the fifth star for its "E" pennant. The sixth award is the highest given to any plant, and only about 100 plants in the country have received this recognition.

◆

AGREEMENT WITH EUREKA CO., MEXICO CITY, MADE BY HEWITT RUBBER CORP.

A working agreement with Fabrica de Artefactos de Hule Eureka, S. A., Mexico City, has been negotiated by Hewitt Rubber Corporation, of Buffalo, according to a recent announcement. The Mexican company is one of the largest manufacturers of mechanical rubber products in that country.

Terms of the agreement, as stated by Thomas Robins, Jr., president of Hewitt, and Manuel Escandon, manager of Eureka, specified that Hewitt will supply mechanical equipment and technical knowledge to increase the output of the Mexico City City com-

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BUILDING—tomorrow's wakening giant

After war's final "cease-firing", look for the building industry to go places . . . for vast cities-within-cities to take shape. They're on drafting boards today.

Air conditioning and ventilating will be widened to include removal of dust, bacteria and odors from the atmosphere by unit-type air sanitation equipment. On the upswing will be radiant heating, zoned heating, service hot water, spot cooling units . . . gas air conditioning which regulates humidity . . . a single heat pump system which heats buildings or cools them as desired.

Controlling liquids and gases in miles-on-miles of tomorrow's piping will be thousands and thousands of Fairbanks Valves. They will have been selected because of topflight past performance . . . because architects and engineers know they can expect freedom from failure when a Fairbanks is installed.

Whether it's a small bronze valve or a huge iron body gate valve with a 24-inch opening the name Fairbanks stands for sound engineering, careful chemical and metallurgical control of alloys, ample metal for the job. The full line is given in catalog "42" which will be sent you if you ask for it. If you need special assistance with individual problems of valve selection and application, call on the facilities of the Fairbanks Engineering Department.

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pany. In consideration of this assistance, Hewitt acquires a preferred stock interest in Eureka, plus annual service fees.

The Eureka company is 25 years old. Among its products are rolls for printing presses, many types of industrial hose, transmission and conveyor belts, and molded rubber items for industry.

◆

CRANE CO. ADVANCES SALES, BRANCH HOUSE PERSONNEL

Crane Co., Chicago, has announced the following changes in its Sales and Branch House divisions, effective June 16:

Carter T. Polleck, formerly manager of the Chicago branch, is made manager of the Central District, with headquarters in Chicago.

W. A. Burbine, formely manager of the company's Cleveland branch, is made manager of the Chicago branch.

A. N. Rosborough, formerly manager of the Toledo branch, has been appointed manager of the Crane branch in Cleveland.

W. D. LaRue, manager of the Muncie, Indiana, branch, is promoted to the managership of the Toledo branch.

R. C. Danielson, formerly manager of the Plumbing Department at the Indianapolis branch, is made manager of the Muncie branch, replacing Mr. LaRue.

◆

HOMER J. BUCKLEY FORMS A NEW ORGANIZATION

A year ago, Homer J. Buckley turned over his business, Buckley, Dement & Company, to a group of long service employees. Mr. Buckley has just announced the formation of a new organization to be known as Homer J. Buckley & Associates.

The new company will offer complete advertising and counseling services, with special emphasis on accounts whose products and services cover the Graphic Arts markets. Mr. Buckley was the founder and first president of the Direct Mail Advertising Association. Associated with him in his new organization will be Scott Robertson and M. E. Nyhan, both of whom have worked with him for many years.

◆

DU PONT MAKES IMPORTANT CHANGES ON PACIFIC COAST

West Coast manager of the Electrochemicals Department, E. I. du Pont de Nemours and Company, is a newly created position which will be filled by Albert R. Tucker, according to a recent announcement from the company.

Because of the rapid pace of industrial development in California and the Pacific Northwest with consequent increased demands for formaldehyde, ceramics, cyanides, peroxides, metallic sodium and chlorinated hydrocarbons, company activities in the region are being undertaken.

In line with this expansion, the company's El Monte plant and sales office at El Monte, California, and the district sales office at San Francisco, will be consolidated under Mr. Tucker, who has been Philadelphia district manager for the department since 1936. West Coast headquarters will be maintained at El Monte.

◆

PAPER INDUSTRY SALUTED BY CRANE CO. THROUGH ITS "VALVE WORLD"

Through its magazine *Valve World*, the Crane Co., Chicago, has been publishing special material saluting various industries.

The April-May, 1945, issue of this magazine is a special presentation of articles, all profusely illustrated, saluting the paper industry. Following the Foreword is a frontispiece illustration of a beater in operation. The following articles comprise the contents of the publication which is 32 pages and cover:

"Pulp and Paper—Our New Sinews of War"

"Paperboard Goes Amphibious"

"The Art of Papermaking—Its Early History, Development, and Present-day Methods"

"Meeting Vast Demands for Wood Pulp and Paper After V-E Day"

"Generating Steam in Pulp and Paper Mills"

The cover of the magazine is a very appropriate piece of artwork.

◆

▶▶▶ FOR THE SOUTHEASTERN area Warren Steam Pump Company, Warren, Massachusetts, has appointed C. E. Johnson & Associates, Atlanta, Georgia, as sales representative. The territory covered will comprise the State of Georgia, eastern Tennessee, northern Alabama, and eastern Florida.

◆

▶▶▶ A NEW FEATURE of the IPI Essay Contest is a "Certificate of Honor" especially designed for International Printing Ink by Dr. Frederic W. Goudy. The certificate will be presented to the printing teacher of each competing school in recognition of his co-operation in making the contest so successful. The contest is now in its ninth year and winners will be announced before the end of this school year.

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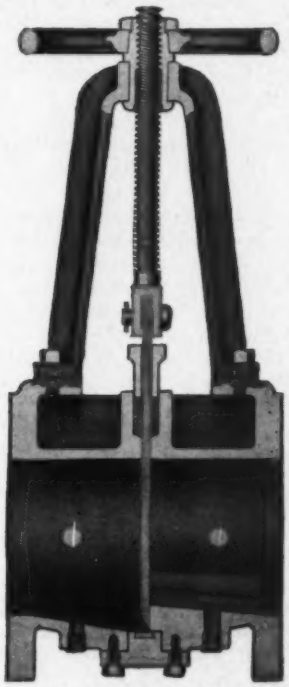
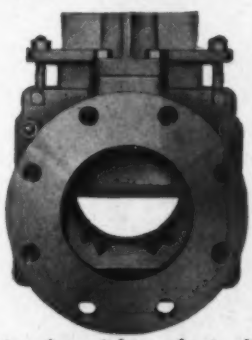


Cross-section view of (patented) Crane Iron Body Pulp Stock Valve No. 1425. No-bonnet design eliminates space where pulp can accumulate. Shearing-action disc cuts trapped fibers and seats tightly. Self-cleaning; easy-operating; non-resisting to flow.



View from inlet end. As disc comes down, step-like notches in outlet port "comb" trapped solids and make shearing easier.

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TEN PAPERS AWARDED DIVISIONAL PRIZES IN "BOLTON AWARD" CONTEST

At the annual meeting of the American Pulp and Paper Mill Superintendents Association, held in Chicago in 1944, John W. Bolton & Sons Company offered to sponsor a contest for superintendents of pulp and paper mills in this country and Canada, and to offer prizes for the best articles written on selected subjects.

The plan was approved by the Association's trustees, and a "Bolton Award" Committee was appointed to arrange for the contest. The subjects selected by the committee, in joint session with the officials of the Bolton Company, were as follows:

"How to Promote Better Relations Between Workers and their Immediate Foremen."

"The Part a Superintendent Should Play in Developing and Sponsoring Harmonious and Co-operative Employer-Employee Relations."

"How Can the Superintendent Encourage His Men to Suggest Ideas for More Efficient Operation."

The contest was not confined to members of the Superintendents Association, but was intended through them to include superintendents and foremen in North American paper mills. The contest closed January 1, 1945, and the articles have now been passed on by the divisional judges. Six prizes have been awarded in most of the divisions. The ten first winning articles are now being judged for the first, second and third national prizes which will be announced in the next issue of this publication. The divisional prize winners were as follows:

First Prize—$200
Second Prize—$100
Third Prize—$25
Fourth Prize—$25
Fifth Prize—$25
Sixth Prize—$25

All of the prizes consist of U. S. War Bonds.

Connecticut Valley Division—Robert Pattison (first), Sidney A. Brown (second), Frank H. Williams (third), Walter F. Hoffman (fourth), Matthew Horgan (fifth), and Arthur Hobday (sixth).

Miami Valley Division—Dean W. Newell (first), G. H. Williams (second), Sam W. Yares (third). No fourth, fifth, or sixth prizes were awarded.

Michigan Division—Gordon Morseth (first), Wm. H. Astle (second), Arthur Thero (third), Joe Waber (fourth), James A. Dean (fifth), and Ben Wessner (sixth).

New York-Canadian Division—Kenneth Mackenzie (first), Paul A. Dodd (second), John Buss (third), Ray A. Stocker (fourth), N. I. Howe (fifth), and G. V. Marx (sixth).

Northeastern Division—Edward T. Jones (first), O. H. Messecar (second), Oscar Anderson (third), Frank W. Roberts (fourth), Wm. LaPointe (fifth), and James Wishart (sixth).

Northwestern Division—Cecil Parvin (first), Wm. Herriott (second), Robert Caple (third), H. E. Niermeyer (fourth), C. H. McCarthy (fifth), and Carl Magnus (sixth).

Pacific Coast Division—R. B. Height (first), Jack V. Savage (second), H. E. Burrell (third), W. C. Gigler (fourth), L. R. Hartman (fifth), and Auston Wyman (sixth).

Pennsylvania-New Jersey-Delaware Division—Harrison Beardsley (first), S. Carroll Wentz (second), Oscar

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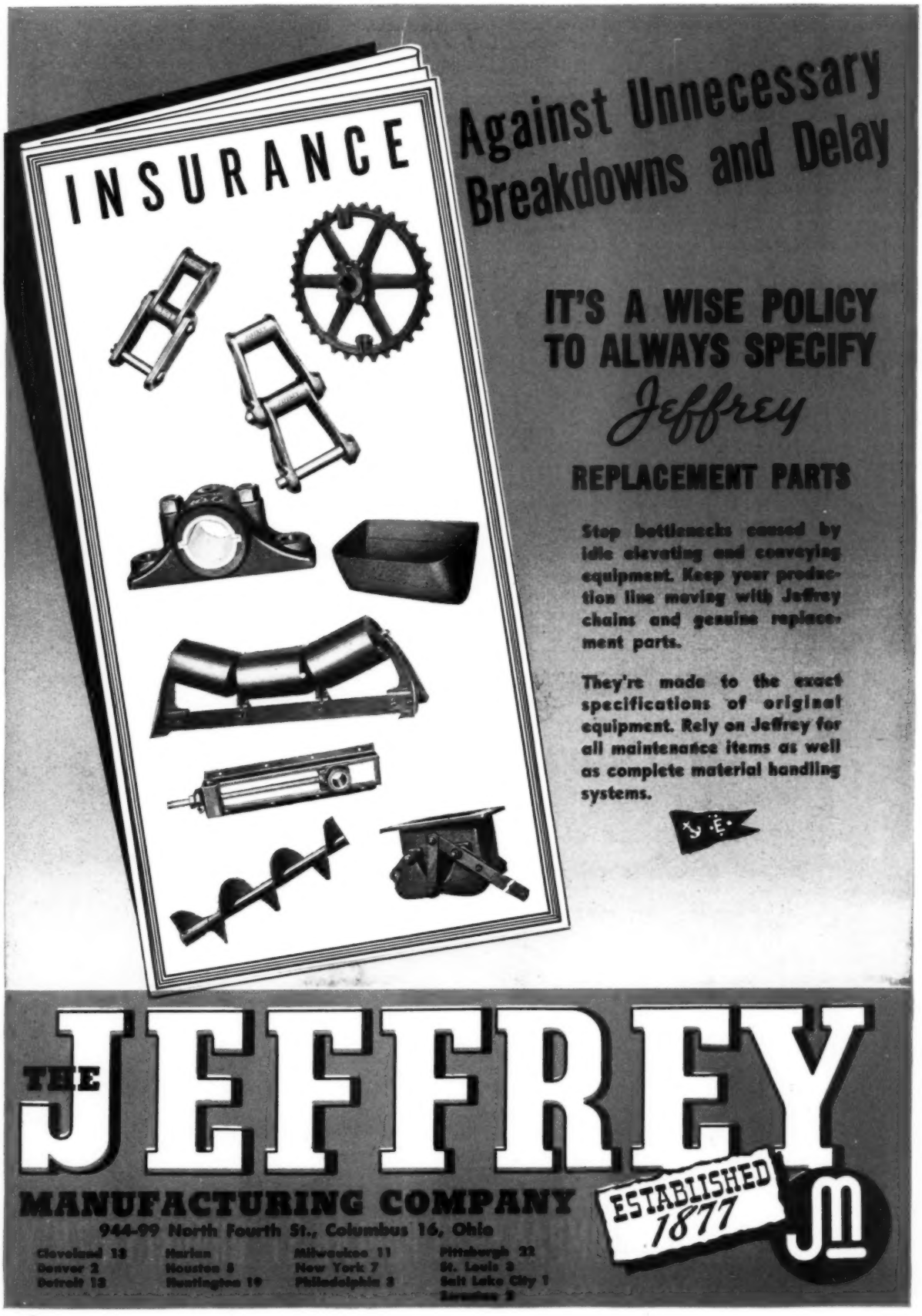
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Stamets (third). No other awards were made.

Southeastern Division — C. A. Shoudy (first), Raymond Bullock (second), Curt A. Young (third), Howard Wehr (fourth), C. R. P. Cash (fifth), and W. P. Guenther (sixth).

Southern Division—E. A. Newman (first), John Smith (second), James Stinson (third), L. L. Lapeyrouse (fourth), and John W. Joyner (fifth), No sixth award was made.

◆

ASBESTOS TEXTILE INSTITUTE FORMED

Recent discussions by a number of asbestos textile manufacturers have led to the formation of the Asbestos Textile Institute, with offices in 12 S. 12th Street, Philadelphia 7. It is a voluntary, non-profit, unincorporated organization whose function is to render service to manufacturers, to the trade, and to users of asbestos textiles. Membership in the Institute is open to all individuals, corporatoins or others located in the U. S. who manufacture textiles from raw asbestos fibers.

With the formation of the Institute, the following companies, who represent a major portion of the asbestos textile production capacity in this country, became members: Asbestos Textile Company, J. Franklin Burke & Company, Carolina Asbestos Company, Garlock Packing Company, Johns-Manville Corporation, Keasbey & Mattison Company, Philadelphia Asbestos Company, Raybestos-Manhattan, Inc., Southern Asbestos Company, and Union Asbestos & Rubber Company.

Among the various activities contemplated by the Asbestos Textile Institute are the establishment of uniformly high standards of quality, research to develop new uses and new markets for asbestos textiles, and the preparation and distribution of technical and general information that will be of interest and value to engineers, designers, distributors, manufacturers and the general public.

The officers elected to head this new Institute are: C. H. Carlough of Carolina Asbestos Company, President; George Marshall, Jr., of Raybestos-Manhattan, Inc., vice-president; William C. Scott of Keasbey-Mattison Company, treasurer, and Harris D. McKinney, the Institute manager and secretary.

The Board of Governors is composed of: C. H. Carlough, chairman; G. S. Fabel, of Southern Asbestos Company; George Marshall, Jr.; W. C. Scott; E. R. Teubner, Jr., of Philadelphia Asbestos Company; and F. J. Wakem, of Johns-Manville, Corporation.

It is contemplated that the work of the Asbestos Textile Institute will be an important factor in broadening the general understanding of the innumerable uses and applications of asbestos textiles. It is also expected that its activities will contribute to an expanding demand for asbestos textile products under postwar conditions. Such a trend should be reflected in the form of steadier employment throughout the industry.

◆

OLD-TIMERS SPEAK AT LUNCHEON OF EAST. DIV. SALESMEN'S ASSOCIATION

J. L. Fearing and H. F. Harrison, vice presidents of International and West Virginia Pulp and Paper companies, respectively, were the honored guests of the Salesmen's Association of the Paper Industry at the Eastern Division luncheon Monday, May 21, when a record attendance of eighty heard the two old time salesmen talk of early selling problems in the paper industry.

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THE ONE-MAN-GANG

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Mr. Fearing told of his first experience as a salesman of paper in 1897 and visualized the problems of the future which will attend the conversion of the nation from a war to a peace economy. He said that good salesmen will be more needed in the future than ever before.

Mr. Harrison told of the manner in which the paper industry first established trade customs in book paper, and then how that principle was extended to other grades of paper until trade customs today are recognized conditions for sales of every type of paper.

GRAPHIC ARTS FILM SHOWN BEFORE CHICAGO PRO GROUP

Nearly 200 members and guests attended the meeting of the Chicago Professional Paper Group at the Engineers Club in Chicago on May 21. At this meeting, the following officers were unanimously re-elected:

President—Harry E. Weston, of Fritz Publications, Inc.

Vice President—F. D. Long, Container Corporation of America.

Secretary—V. V. Vallandigham, of Kelco Company

Treasurer—Arnold McAneny, of Bradner-Smith & Company

The main feature of the evening was the graphic arts film "The Material Side of Printing." The production of this film was sponsored by the Young Printing Executives Club of New York. The film runs a full 1½ hours.

◆

THE INSTRUMENT SOCIETY IS NEWLY ORGANIZED GROUP

Delegates from 15 measurement and control instrument societies that have been growing in different industrial centers throughout the country met in Pittsburgh recently and formed a new national society to be known as The Instrument Society of America.

The purpose of the Society will be to advance the arts and sciences that are connected with the theory, design, manufacture, and use of instruments. The Society is non-professional, and offers membership to any person, firm or institution interested in the objectives of the group.

Pro tem officers were elected and various committees were appointed to proceed with the organization work and preparation of constitution and by-laws. The office of the pro tem secretary, Richard Rimbach, is the temporary office of the Society and is located at 1117 Wolfendale Street, Pittsburgh 12, Pennsylvania.

◆

COMING EVENTS

October 4-5—Pennsylvania-New Jersey-Delaware Division of the American Pulp and Paper Mill Superintendents Association will not hold any spring meeting this year, but plans are being formulated for a meeting in the fall on these dates. Time and place to be announced later.

The annual Safety Congress, customarily held each year by the National Safety Council, Chicago, will not be held this year.

STATED MEETINGS

Technical Association of the Pulp and Paper Industry

Delaware Valley Section—First Friday of each month at the Engineers' Club, Philadelphia, Pa.

Empire State Section—Second Thursday of each month at the Woodruff Hotel, Watertown, New York.

Kalamazoo Valley Section—First Thursday of each month, including June, at 6:30 p. m. at the Columbia Hotel, Kalamazoo, Mich.

Lake States Section—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

New England Section—Third Friday of each month, at the Roger Smith Hotel, Holyoke, Mass.

Chicago Professional Paper Group

The third Monday of each month at Chicago Bar Association, Chicago. (Except July and August)

A WELL ENGINEERED INSTALLATION AT S. D. WARREN COMPANY, MANUFACTURERS OF QUALITY PRINTING PAPERS, CUMBERLAND MILLS, MAINE . . . ASSISTED BY A WARREN PUMP.

Paper Mills place a premium on reliability and performance. At Cumberland Mills the plant hydraulic elevator pump has a dual drive turbine and synchronous motor.

The turbine driver is used to regulate heat balance and to supply process steam. Pump requirements are thus served with by-product power. The synchronous motor generates when the steam demand exceeds the pump load and operates as a motor when the demand is less. Pump power costs are reduced to a minimum.

In addition to building pumps for every paper mill service, Warren cooperates with plant engineers in working out money-saving installations.

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.
WARREN, MASSACHUSETTS

If you could take a drop of turbine oil apart...

you'd see why troublesome acidity and deposit formation are eliminated with

NONPAREIL
TURBINE OIL

PETROLEUM CHEMISTS can take a drop of oil apart and put it together again. They explain what they find with complicated signs and symbols. But here's a practical explanation.

A drop of unrefined oil is peopled with innumerable types of hydrocarbons—some good, some bad, and some on the fence. It also contains natural oxidation-inhibitors. These are the policemen that help keep order in this world of hydrocarbons.

All of the hydrocarbons have a thirst for oxygen. The principal difference between them is this: The bad hydrocarbons take all the oxygen they can get. The natural inhibitors can't stop them. The good hydrocarbons, and those on the fence, can take it or leave it alone. They are good as long as the natural oxidation inhibitors are around.

When the bad hydrocarbons are put into a turbine, where there is plenty of both heat and oxygen, they go from bad to worse. Some of them form the asphalt-like sludge you may have found in a turbine. The natural inhibitors can't do much about this because they are overcome in the free-for-all oxygen spree.

It seems obvious then that the first step in making a good turbine oil is to take out all the bad hydrocarbons. But here's the catch. Refining methods that take out the bad hydrocarbons also take out the natural inhibitors. Without them the good hydrocarbons and those on the fence are ready to "raise cain." When the good hydrocarbons get too much oxygen they cause other turbine oil troubles as a result of rapid acidity development.

Therefore, most conventional turbine oils are made by leaving in them part of the bad hydrocarbons (even though they eventually form deposits) in order to keep enough natural oxidation inhibitors to slow down acidity formation.

But this oil is a compromise. Standard Oil chemists wanted a better solution. They wanted to use a highly refined oil and eliminate all asphaltene deposits. It could be done by adding an oxidation inhibitor to take the place of the natural ones. The hitch here was finding that inhibitor.

Standard Oil developed such an inhibitor. It was added to a highly refined white oil, the process was patented, and the product was called Nonpareil Turbine Oil. That's why Nonpareil is the only turbine oil that is completely free from asphaltene-forming hydrocarbons, with a *guarantee in writing* that it will not increase in acidity above the low neutralization number of 0.15 mg. KOH/gm. for the life of your turbine.

A Standard Oil Lubrication Engineer can tell you what this freedom from deposits and acidity formation means in lower maintenance costs and greater safety of operation. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

THE

SMITH & WINCHESTER MFG. CO.

• Since 1828 •

continuously
we have served the

PAPER INDUSTRY

with the finest in

PAPER MILL MACHINERY

During the progress of World War II, our plant and facilities have been devoted primarily to the war effort.

Replacements, or repairs to your machines, can be furnished under required priority rating.

"Undercut" Trimmers
Paper Bag Machinery
"Rainstorm" Shower Pipes
Stuff Pumps — Jordans

—Office and Plant—
South Windham, Conn.

SAFETY

STANDARD OIL (IND.) SALES DEPARTMENT HAS WON 15 SAFETY AWARDS

Fifteen safety awards have been won by the Sales Department employees of Standard Oil Company of Indiana from the American Petroleum Institute. Each award recognized success in prevailing accidents in a different branch of operations or location for 1,000,000 or more man-hours of work without loss of time or disabling injury.

Of the 15 awards, the one for the most man-hours worked without disabling injury was presented to office employees of the Chicago sales division who had a record of 4,149,900 man-hours. Next were commission agents and drivers of the Green Bay (Wis.) sales division with 3,075,302 man-hours.

The first safety department in the petroleum industry was established by Standard of Indiana at its Whiting, Indiana, refinery in 1918. The work was extended to the company's sales department five years later.

◆

PROPOSE ADOPTION OF STANDARD SAFETY COLOR CODE FOR NATIONAL USE

Basis of the standard safety color code proposed for national use by the American Standards Association is the safety system now in use in Quartermaster and Army Service Forces Depots.

Recognizing the Army's need for a standard code, Colonel F. B. L. Myer of the Office of the Quartermaster General proposed such a system in April 1944. Prompting the adoption of the plan was the Army's widespread safety problem. Supply depots, with military and civilian personnel running into thousands, are scattered throughout the country. Fires or accidents in these Depots hold up shipments of vital supplies.

Color schemes for identification of various hazards have been used in the past by industrial plants, but there has been no uniformity in colors used. As a result, spontaneity of action in emergencies is lost, particularly when employees move from one plant to another.

Red, green, yellow, white, and black, and combinations thereof, were the colors finally agreed upon for the Quartermaster and ASF Depots. Red is used to identify fire protection equipment, and danger and stop signals. Green is the basic color for designating safety—the location of first aid equipment, dispensaries, stretchers, gas masks, and safety starting buttons. Yellow indicates the need for caution and marks physical hazards, such as obstacles which may cause stumbling, the projections of machinery, or pillars. Black, white or a combination of these two shall be the basic colors for designating housekeeping, sanitation and traffic markings. Solid black, solid white, or either striped or checker combinations are recommended for direction signs, corners, passageways, stairways, dead ends, traffic guides and refuse cans. Great care has been taken not to conflict with signals used in sea and air navigation or rail transportation.

The code, as set up by the American Standards Association, will be sent to safety engineers and interested organizations throughout the country for suggestions and final comment. In 1927, the Association unified on a national scale the colors now used in traffic lights, and in the 26 years of its existence has created more than 700 industrial national standards.

◆

NATIONAL SAFETY CONGRESS WILL NOT BE HELD IN 1945

As this issue goes to press, announcement is made by the National Safety Council, Chicago, that the annual Congress, customarily held each year, will not be held this fall.

Information concerning the contests will be published as early as available. However, there will be no interruption of the paper industry safety contest; the new contest for 1945-46 will begin July 1.

◆

SAFETY SCORES

▶▶▶ PERFECT SCORES are recorded for eight mills at the close of April, the tenth month in the 1944-45 Paper Industry Safety Contest. The following list of mills have a perfect record:

Division I—Pulp and Paper Mills

Groups A, B, and C (None)

Grade D

Marathon Corp. (Ashland Div.)
Strathmore Paper Co. (Woronoco Mill No. 1), West Springfield, Mass.
*Central Fiber Products Co., Denver.
E. I. du Pont de Nemours & Co., Newhall, Wilmington, Del.

Division II—Paper and Board Remanufacturing

Ft. Wayne Corr. Paper Co., Chicago.
Bird & Son, Inc. (Roofing Plant), Shreveport, La.
Iowa Fibre Box Co., Keokuk, Iowa.
Bay West Paper Co., Green Bay, Wis.

(*) April report missing.

FOR THE *Right Size* AND COMBINATION CALL ON CYANAMID

ALWAX SIZE—**

For calender, tub, and beater sizing, Alwax Size is made in both high and low melting point waxes. Used in the beater to supplement rosin size, it improves the finish and folding quality, gives a better printing surface, and increases water resistance at a low cost. As a surface size, Alwax Size improves the finish and lays fuzz, gives a water-resistant surface, and assures uniform dyeing.

WAXINE* SIZE—

Made from a combination of rosin and wax, Waxine Size improves the fold and the printing quality of paper. Printing is more uniform, and because of the absorption of vehicle by the paper, there is less chance of offset. Paper or board sized with Waxine Size has less tendency to change dimensions with varying humidities, and thus gives less misregister on printing.

Both Alwax and Waxine Sizes are produced in several standard grades to meet diversified requirements.

ROSIN SIZE—

Cyanamid manufactures a complete range of rosin sizes from [illegible] grades for light-colored papers and other more economical grades for use where color considerations are secondary. Pale wood rosin size comparable in color to high grade gum size is now produced, bringing to the paper manufacturer the much-sought-after advantages of exceptional cleanliness and uniformity.

A definite production cost saving can be effected in the sizing of most paper and paper board by the use of wax size in combination with rosin size. At the same time, paper quality can be improved.

Cyanamid technical service men and sales personnel will be glad to discuss the application of wax and rosin sizes with you. Just write or call your Cyanamid representatives.

**Trade-Mark

Waxes • Wax Sizes • Rosin Size • Synthetic Resins • Casein Alum • Sulphonated Oils • Fillers • Defoamers • Soda Ash Caustic Soda • Salt Cake • Acids • Clays • Satin White Aerosol* Wetting Agents • Calmicro (Calcium Carbonate) and other Paper Chemicals. *Reg. U. S. Pat. Off.

When Performance Counts... Call on Cyanamid

American [illegible] & Chemical Corporation

(A UNIT OF AMERICAN CYANAMID COMPANY)

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

DISTRICT OFFICES: Boston, Mass.; Philadelphia, Pa.; Baltimore, Md.; Charlotte, N. C.; Cleveland, Ohio; Chicago, Ill.; Kalamazoo, Mich.; Detroit, Mich.; St. Louis, Mo.; Azusa, Calif.; Seattle, Wash.; In Canada: Dillons Chemical Company, Ltd., Montreal and Toronto.

WESTINGHOUSE

Says

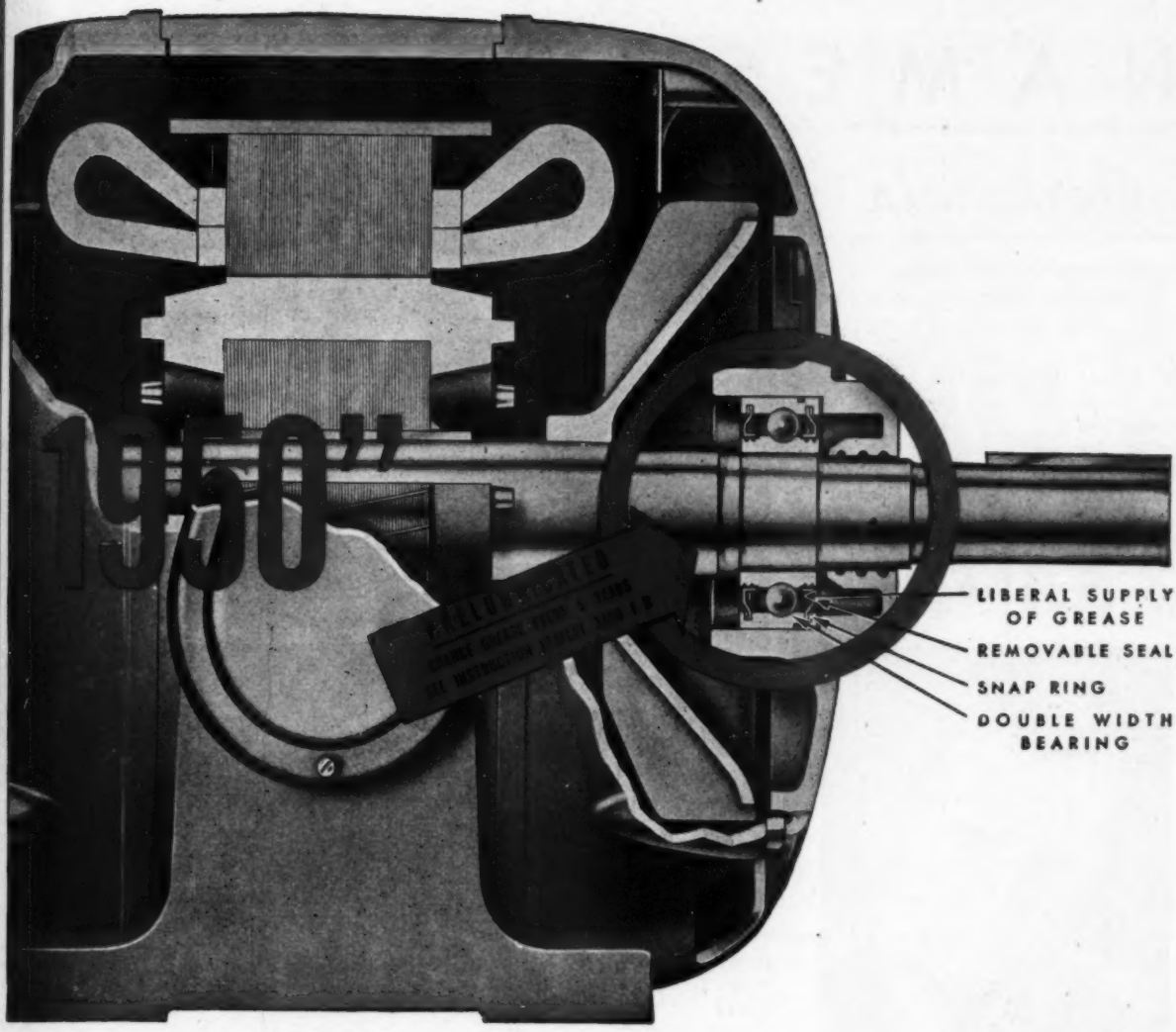
"No Lubrication

in describing their new

TYPE CSP MOTORS

AND BROTHER THEY AIN'T KIDDING!!

Bearings by NORMA



The performance of NORMA-HOFFMANN DOUBLE-WIDTH PRELUBRICATED "CARTRIDGE" BEARINGS in actual field service over the past eight years emphatically supports this statement.

PATENTED

-HOFFMANN

NORMA-HOFFMANN BEARINGS CORP'N. STAMFORD, CONN. *Founded* 1911

Field Offices: NEW YORK • CHICAGO • CLEVELAND • CINCINNATI • PITTSBURGH • DETROIT • LOS ANGELES • SAN FRANCISCO • SEATTLE, WASH.

NAMES *in the* NEWS

Personals

JACK BEIERWALTES NOW WITH WATERVLIET PAPER CO.

An announcement from the Watervliet Paper Company, Watervliet, Michigan, states that Jack Beierwaltes has become associated with that organization.

Mr. Beierwaltes was formerly sales manager of the E. J. Kelly Company, Kalamazoo, Michigan, ink manufacturers. He joined that company as a laboratory assistant in 1935 upon graduation from the University of Michigan. He was subsequently appointed advertising manager and later sales

Jack Beierwaltes

manager. He has contributed a number of articles to the trade press.

At Watervliet, Mr. Beierwaltes immediately will engage in research work in relation of printing ink to paper surfaces. Ultimately, his efforts will extend to technical service and sales activities. His association with the Watervliet company is expected to supplement the technical service facilities of that company in the rather unique manner of combining experience in the use and manufacture of printing inks with that of paper.

◆

▶▶▶ The appointment of *Armin G. Kessler* as manager of sales of the midwestern district has been announced by Farrel-Birmingham Company, Inc., Ansonia, Connecticut. Mr, Kessler has been associated with F-B since 1920,

Armin G. Kessler

and has been a vice president and director of the firm since 1923. Prior to his present appointment, he was general works manager of the three Farrel plants in Ansonia and Derby, Connecticut, and Buffalo, New York. Mr. Kessler will make his headquarters in Akron, Ohio.

◆

▶▶▶ Former sales engineer in Detroit for Heppenstall Company, Pittsburgh, *James C. Patton, Jr.*, has been placed in charge of the company's Chicago sales office. He succeeds *Lee A. Daines*, vice president and general manager of sales, who left the Chicago office on May 1 to assume his current duties in Pittsburgh.

James C. Patton, Jr.

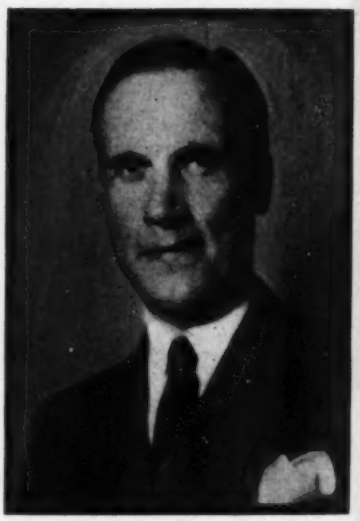
▶▶▶ Formerly assistant manager of advertising of the Pennsylvania Salt Manufacturing Company, Philadelphia, *Ethel Serfas Klingman* has been promoted to manager of advertising, succeeding H. M. Ellsworth, who resigned on May 1.

◆

GOSTA HALL NOW SALES MGR. OF KORSNAS CO.—IN SWEDEN

Friends of Gosta Hall will be pleased to learn of his appointment as sales manager of the Korsnas Company in Sweden. Mr. Hall's most recent connection was technical director of the Swedish Pulp Company.

Mr. Hall is well known in the American paper industry. He has had a great deal of experience in paper



Gosta Hall

and pulp mills in this country as well as in Europe, and he was a member of the Swedish Trade Mission to the United States last year representing the Cellulose and paper industries of Sweden. He has contributed to the trade literature and is also known as a lecturer.

Pagel, Horton & Company, Inc., 347 Madison Avenue, New York City, acts as agent in the United States for Korsnas Company.

◆

▶▶▶ *Sam Hodge* has been placed in complete charge of all operating departments at the Lockport (New York) mill of the United Paperboard Company. This arrangement became effective June 4. Mr. Hodge succeeds *L. L. Hank*, who is no longer with the company.

What have you that's

CORRODING?

Use Up-to-the Minute Experience that Insures Less Corrosion Losses

The list of Weldco products is wide and varied — standard and special — designed, engineered, and manufactured of corrosion and heat resisting metals to reduce production time-out periods and maintenance losses. Whatever your corrosion problem may involve, whether it be a length of pipe or a piece of complicated equipment . . . a few feet of chain or a giant tank, let Weldco engineers come up with a solution for you. The Youngstown Welding & Engineering Company has 150,000 square feet of floor space filled with modern fabricating equipment. Its 33 years of broad experience in specialized welding and fabricating are well worth your consideration. *Write today for special data on your individual problem or for folders on standard Weldco products.*

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY

3752 Oakwood Ave. Youngstown 9, Ohio

THE YOUNGSTOWN WELDING & ENGINEERING CO.
3752 Oakwood Ave. Youngstown 9, Ohio

Mail me your literature.

Company Name_____

Your Name_____ Title_____

City_____ State_____

Specialists in Corrosion Resistance **WELDCO**

▸▸▸ New appointments in its blower and compressor department have been announced by Allis-Chalmers, Milwaukee, Wisconsin. *Charles F. Codrington* has been made assistant to the manager, and A. E. Caudle has been appointed sales manager. These appointments have been effective since May 1.

◆

BLACK-CLAWSON ANNOUNCES PERSONNEL PROMOTIONS

Allan Hyer, who has been on a leave of absence from The Black-Clawson Company, Hamilton, Ohio while serving with the WPB, has now been appointed vice president and sales manager of The Black-Clawson Company's plant at Hamilton. He has resigned his position with the WPB.

Tom Latimer, who came to the company as sales engineer, has been appointed chief engineer.

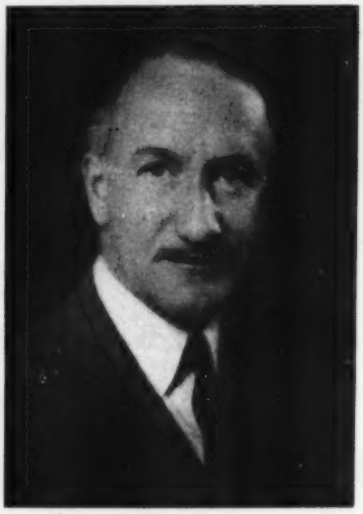
L. O. Kiehborth, who served as auditor for the three plants—The Black-Clawson Company, Hamilton, Ohio; Dilts Machine Works, Fulton, New York; and Shartle Brothers Machine Company, Middletown, Ohio, has been appointed secretary of Black-Clawson.

Peter Jerardi, who came to the company from the International Paper Company, has been appointed production manager of the Hamilton plant.

30TH ANNIVERSARY WITH SKF MARKED BY DE MOTT

This year, Richard H. DeMott, vice president in charge of sales, SKF Industries, Inc., Philadelphia, is observing his 30th anniversary with the company.

Prior to joining SKF in 1915, Mr. DeMott was connected with a number of wellknown, national organizations. His first job after receiving his engineering degree at Stevens Institute of Technology was with Worthington Pump Company, Harrison, New Jersey. Later, he was connected with Crocker-Wheeler Company, Westinghouse Lamp Company, Johns-Manville, and Public Service Company of New Jersey.



Richard H. DeMott

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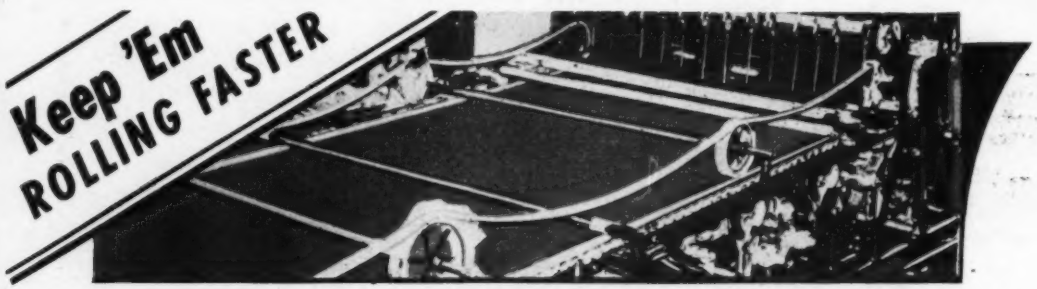
CONSOLIDATED PAPER CORP. ANNOUNCES PROMOTIONS

Consolidated Paper Corporation, Ltd., Montreal, Canada, has honored with promotions three members of the organization who are well known in the industry:

George Henderson, who has been controller of the corporation, is now vice president and controller. He was with the Wayagamack Pulp and Paper Company before the consolidation.

Arthur Dawe is made vice president and general manager of St. Maurice Valley Paper Company, the sales department of the corporation. Mr. Dawe has a wide knowledge of newsprint and the world-wide market for this product.

J. O. Chenevert is now vice president and general manager of Wayagamack Sales, distributors of kraft pulp and paper. He has sepcialized in the study of marketing wrapping paper, and is an authority on grade and trade.



with Magnus Felt Conditioners

When you clean a felt, you should do much more than remove the dirt deposit. Removing the dirt does not necessarily restore the nap, or give you a soft, absorbent felt.

Use the cleaners that *condition* your felts, choosing the Magnus Felt Conditioner that best meets your requirements. There is Magnus Feltex, for cleaning felts off the machine. And Magnus NX for conditioning old felts, as well as for breaking in new felts, on the machine. There are other special Magnus Cleaners, for paper mill felts, including Magnus D-Scale-R for cleaning badly limed felts.

If you want well cleaned felts, with nap and absorbency restored, insuring longer periods of service at top speed, investigate the Magnus line of Felt Conditioners, that not only clean thoroughly, but rinse out *completely*.

MAGNUS CHEMICAL CO. 192 SOUTH AVENUE, GARWOOD, N. J.

Magnus Paper Mill Cleaners

What has saving life at sea to do with the production of Azo dyes?

Simply this.

Because of its specialized experience in the field of Azo dyes, Calco was selected to manufacture certain war materials on

direct contract to the Army and Navy. This has resulted in the curtailment of shipments to our regular customers.

For example, a part of our Azo dye equipment has been diverted to Uranine, the brilliant greenish yellow dye used in life jacket dye markers which have been responsible for saving more than 30% of those rescued at sea.

To meet the pressing demand for Uranine, Calco's production has increased from a mere trickle in 1940 to hundreds of thousands of pounds in 1944.

Yet this is only a fraction of Calco's total war contribution.

Putting first things first has developed into a tremendous wartime job at Calco. It is work of which we are proud—and in which we ask your understanding. You may be sure that everything is being done to meet your requirements—with all the extra time, labor and effort we can muster.

Heller & Merz Department

CALCO CHEMICAL DIVISION • AMERICAN CYANAMID COMPANY

Bound Brook, New Jersey

New York • Chicago • Philadelphia • Boston • Charlotte • Providence

D. D. DAVIS BECOMES PRESIDENT OF M. AND O.

At the annual meeting of the board of directors, held on May 28, R. H. M. Robinson, president of the company since 1941, was made chairman of the board. D. D. Davis, who has been associated with the company since last November, was made president to succeed Mr. Robinson.

Mr. Robinson has been with M and O for the past 14 years. He was appointed a receiver in 1931, and later co-trustee and managing receiver. Within ten years after he assumed office, Mr. Robinson brought the company out of receivership, and upon reorganization in February, 1941, he was elected to the presidency.

Prior to joining the company in November of last year, Mr. Davis was vice chairman of the War Production Board in Washington for two years. Prior to that, he served as president of General Mills, Inc.

◆

EARL BRENNAN IN NEW CONNECTION—WILL OFFER SERVICE TO PAPER MFRS.

Paper manufacturers will be interested in a recent announcement by the Railway Supply & Manufacturing Company, Cincinnati, Ohio. On June 1, Earl M. Brennan joined that company as director of service to paper manufacturers. This addition to the company's technical staff will enable Railway Supply to further extend its research and technical service to papermakers in connection with the use of cotton linters in the making of fine paper.

Mr. Brennan is particularly well qualified to serve papermakers in connection with their production problems because of his wide experience in paper and pulp technology. He brings to his new position eighteen years of experience in pulp and paper technology. He served for fifteen years as a member of the research department of the Brown Company, Berlin, New Hampshire. During the past three years he has been associated with The Pollock Paper & Box Company, Dallas, Texas, converters of waxed and special coated papers.

◆

▶▶▶ The appointment of *Delmont Auble* as its midwestern representative has been announced by Drycor Felt Company, Belleville, New Jersey. Mr. Auble is a graduate engineer of the U. S. Coast Guard Academy, and brings a broad engineering background to his new duties. He will make his headquarters at the Harrison Club, Cincinnati, Ohio.

R. H. M. Robinson

D. D. Davis

Delmont Auble

PERSONNEL CHANGES ARE ANNOUNCED BY AMERICAN FOREST PRODS. INDUSTRIES

The resignation of Charles R. French as public relations director of the American Forest Products Industries, Inc., Washington, D. C., became effective on June 1.

Mr. French, who has headed the public relations program of the forest industries since 1941, plans to start his own advertising business in Washington. Previously, he was associated with the National Lumber Manufacturers Association for many years.

Simultaneously with the resignation of Mr. French, the American Forest Products Industries, Inc., announced the appointments of Chapin Collins as Washington, D. C. manager, and M. O. Chenoweth as manager of the New York office.

◆

▶▶▶ At the United Nations Conference in San Francisco, *Hugh Moore*, a founder of the Dixie Cup Company, and chairman of its board of directors, was appointed a consultant to the State Department. Mr. Moore has been active for many years in the field of international relations. He is now president of Americans United for World Organization.

◆

VICE PRES. OF J-M SALES CORP. IS HONORED FOR 25 YEARS OF SERVICE

Upon completing twenty-five years with Johns-Manville Sales Corporation, Leslie A. Baldwin, of Greenwich (Conn.) vice president of the company, was honored by his associates at a luncheon given May 8 at Hotel Commodore in New York City. In a ceremony following the luncheon, Mr. Baldwin was inducted into the Quarter Century Club.

In his twenty-five years with Johns-Manville, Mr. Baldwin has held a number of sales and executive positions specializing in selling, engineering and construction work. He has been vice president since 1941.

◆

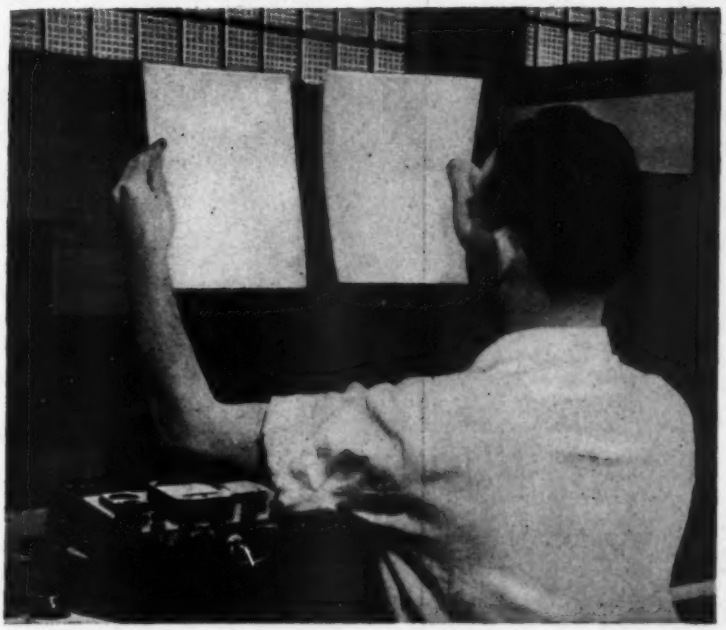
▶▶▶ *Norris Boehmer* and *Clarence Barbre*, formerly operating superintendents at Monsanto Chemical Company's plant at Monsanto, Illinois, have been advanced to the rank of manufacturing superintendents. A rearrangement of supervisory duties, made necessary by plant expansions, and the passing of Robert M. Sanford, manufacturing superintendent, occasioned these promotions. At the same plant, *E. W. Lieben*, *W. Neil*, and *R. L. Miller* have been advanced to the rank of operating superintendent.

SPECIFY "GENERAL CHEMICAL"

...improve formation—appearance—quality

Visual as well as laboratory testing of paper formation establishes the necessity for using a pure, uniform "Alum" in manufacturing a high-grade sheet.

General Chemical Aluminum Sulfate—as well as the Company's other paper-making chemicals—is made with strict attention to every production detail. Constant laboratory control assures product uniformity and purity. For "Alum" you can rely upon, specify **General Chemical:**



aluminum sulfate

Standard—Lump; Ground, 99% thru 8 mesh, 95% thru 10 mesh; Powdered, 95% thru 100 mesh.

Iron Free—Lump, approx. 2½"; Ground, thru 8 mesh.

sodium silicate

Solutions: From 38°—60° Baume — Wt. Ratio (Na_2O to SiO_2) from 1:2.00—1:3.40

Appearance: Opalescent to clear.

GENERAL CHEMICAL COMPANY products for the paper industry

Aluminum Sulfate (Standard and Iron Free) • Copper Sulfate • Muriatic Acid (Hydrochloric) • Sodium Fluoride • Sodium Silicate • Sodium Metasilicate • Glauber's Salt (Crystal or Anhydrous) • Salt Cake Sodium Sulfide • Sodium Hyposulfite • Sodium Sulfite (Anhydrous) Sodium Bisulfite (Solution or Anhydrous) • Disodium Phosphate Trisodium Phosphate • Tetrasodium Pyrophosphate • Sulfuric Acid Nitre Cake (Sodium Bisulfate) • Nitric Acid

BASIC CHEMICALS

GENERAL CHEMICAL COMPANY

FOR AMERICAN INDUSTRY

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

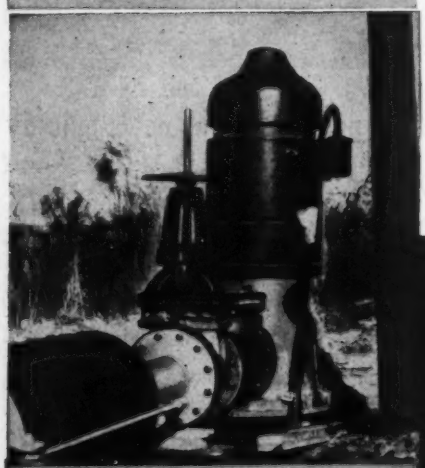
Sales and Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Providence (R. I.) San Francisco • Seattle • St. Louis • Utica (N. Y.) • Wenatchee • Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

PAPER-MILL PUMP MOTORS *that Save on Service*

These three 60-hp G-E induction motors are typical of many hundreds now in service on paper-mill pumps. They are installed at the filter plant of Ecusta Paper Corporation, Pisgah Forest, N. C.



One of five deep-well turbine pumps that meet water requirements of 25 mgd—at Rayonier, Inc., Fernandina, Fla. producer of a cellulose pulp. All are driven by G-E vertical, hollow-shaft induction motors.

THREE factors work for you to save maintenance manpower and service expense when you drive your pumps with G-E motors:

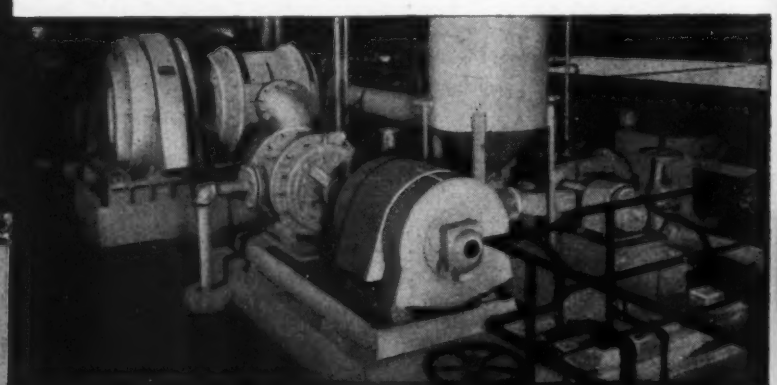
1. Our close contact with pump builders, assuring motor torque characteristics that are matched to the pump. This avoids overheating and lengthens bearing life.
2. Our application-engineering experience, working directly with leading paper mills. This helps us to beat trouble to the punch and provide protection against service hazards peculiar to paper mills.
3. Our wide range of standard motor types and sizes. This enables us to supply performance-proved designs for almost every job.

INDUCTION MOTORS

For stock transfer pumps, white-water return pumps, and other pumps essential to operating continuity, G.E. offers a full line of induction motors built to designs that have been proved in paper-mill service—hollow-shaft vertical motors that meet the needs of deep-well pumps; totally enclosed, fan-cooled motors, in the strongly protected Tri-Clad construction, to drive pumps handling black liquor and other corrosive reagents.

SYNCHRONOUS MOTORS

For plant water pumping, filter pumps, fire pumps, vacuum pumps, and other high-capacity pumping jobs, General Electric's line of high-speed synchronous motors are a frequent choice, offering unusual efficiency here, as on grinders, jordans, and screens. Low-speed synchronous motors (72–240 rpm) are also available for direct drive of reciprocating pumps.



Motors applied to vacuum pumps at mill of Rayonier, Inc. In foreground, G-E induction motor of splashproof construction. In background, G-E synchronous motor.

GENERAL ELECTRIC

MATCHING MOTOR CONTROL that Protects the Savings

FOR synchronous or induction motors, high voltage or low, G.E. offers modern metal-enclosed control that safeguards the motor and the motor circuit from short-circuit currents, and, in addition, performs all the regular motor-starter functions. With the increasing importance of *centralized* control, you'll find it more to your advantage than ever to let a G-E application engineer help you select the right controller and the right enclosure for long-term, low-cost protection.

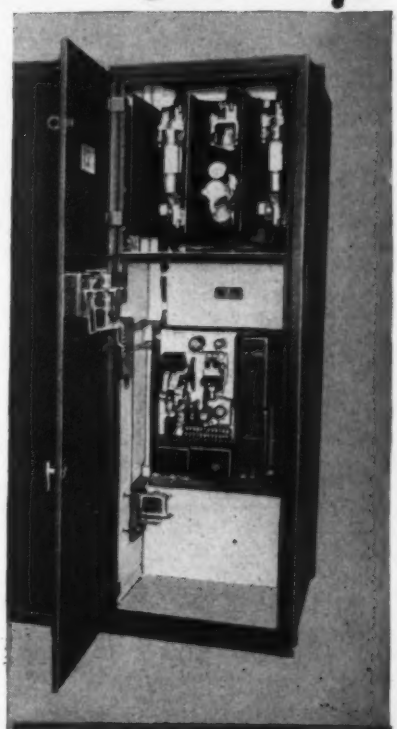
LIMITAMP CONTROL

G-E high-voltage control units, for both synchronous and induction motors, offer the extra safeguard of split-second short-circuit protection that is afforded by EJ-2 current-limiting fuses. The contactors never have to withstand the full short-circuit current that can be supplied by the feeder. This means longer life and less servicing of the clapper-type air-break contactors.

CABINETROL

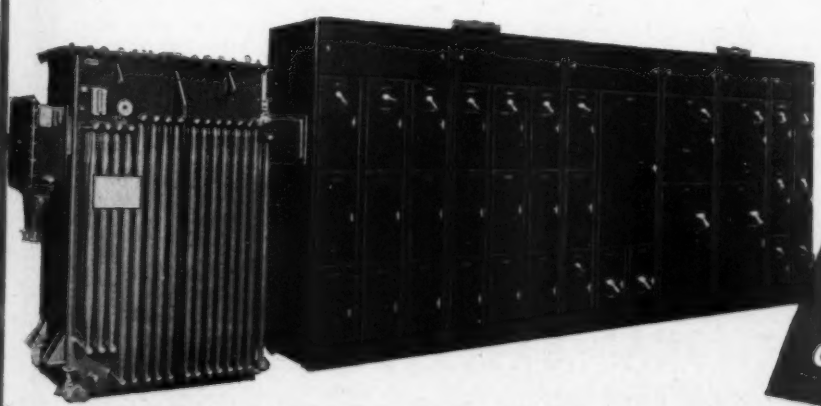
Centralized control of motors (600 v) on pumps, screens, electrically operated valves, and other equipment is more convenient and more fully protected when you have a factory-assembled CABINETROL panel. Interlocking aids in sequence control. Manpower is saved in installation, in maintenance, and operation.

General Electric Company, Schenectady 5, N. Y.



G-E Limitamp controllers for high-voltage motors (induction or synchronous) are of metal-enclosed construction. Separate compartments for high-voltage circuits provide extra safety to personnel. They can be furnished as single units or as a complete, factory-assembled group.

Buy all the BONDS you can — *and keep all you buy*



This modern type of centralized control combines transformer and Cabinetrol (low-voltage motor control) in a single load-center unit.

PAPER-MILL MOTORS and CONTROL

▶▶▶ For the past seven years *A. George Jacques* has been resident manager of St. Lawrence Paper Mills, Three-Rivers, Quebec. He has now been appointed assistant general manager of that company and of Lake St. John Power and Paper Company. He will be moved from Three-Rivers to Montreal. Appointed to succeed Mr. Jacques at Three-Rivers is *S. E. Williams*, who has been resident manager of Lake St. John Power and Paper Company at Dolbeau, Quebec.

◆

▶▶▶ After thirty-three years of service with Sefton Manufacturing Company and Container Corporation of America, *Hammond Harban* announced his retirement, effective May 15. Mr. Harban has been assistant sales manager for Container Corporation.

◆

▶▶▶ *Thomas J. Banna*, president of the Western Gear Works, of Seattle and Los Angeles, and its associate, the Pacific Gear & Tool Works of San Francisco, recently was elected vice president of the American Gear Manufacturers' Association at its annual meeting at Hot Springs, Virginia. Mr. Banna is a member of the OPA Advisory Committee for the gear industry.

UNITED PAPERBOARD CO. ELECTS NEW OFFICIALS

At a recent meeting of the board of the United Paperboard Company, New York City, the resignations of Leeds Mitchell as president, John Drew as vice president and general manager, and Mitchell Todd as vice president and secretary of the company were accepted. The new officers resulting from those changes are: President, Fred Enders; vice president, James Todd, Jr.; vice president in charge of sales, H. W. Kephart; vice president in charge of production, P. M. Loddengaard; secretary-treasurer, John F. Cordes.

◆

▶▶▶ The staff of engineers serving the Cleveland area for The Foxboro Company, Foxboro, Massachusetts, has been increased by the appointment of *Harry D. Wagner*, who already has taken up his new duties at the Cleveland office. Mr. Wagner is well acquainted with industries in that territory, having had much of his business experience there.

◆

▶▶▶ The appointment of *T. U. Blake* as chief engineer has been announced by The B. F. Goodrich Chemical Company, Cleveland. Mr. Blake was previously plant engineer at the synthetic rubber plant in Port Neches, Texas. He will head the company engineering staff serving the Geon resin plants in Niagara Falls, New York; Louisville, Kentucky; and Akron, Ohio; also the company-operated government synthetic rubber plants in Port Neches and Borger, Texas, and Louisville. His headquarters will be in Cleveland.

◆

▶▶▶ The Lithographic Technical Foundation re-elected *E. H. Wadewitz* to serve as its president for another year. Mr. Wadewitz is president of Western Printing & Lithographing Company. He was one of three officers of the industry's research and educational institution who were re-elected to office at the annual meeting of the board of directors held in Chicago on May 10.

◆

▶▶▶ Appointed to succeed *Morse Verret* as forestry engineer in charge of the Hebertville, Quebec, division of the Forestry Information Bureau of the Quebec Lands and Forests Department is *Maurice Kirousac*. The new appointee will be in charge of the northern constituents of Chicoutimi, Lake St. John and Roberval.

Is your mill branded *UNSAFE* by your workers?

Preventable accidents often cause more than physical or mechanical damage . . . they undermine employee morale. Avoidable accidents can start whispering campaigns that delay production and create ill-will for your company.

Workers are quick to fix the blame for accidents. Very often their decision is unfair. The best way to avoid unfavorable criticism is to *prevent accidents* and thus eliminate the reason for criticism.

Thousands of industrial organizations have reduced their accidents 30% to 40% through the adoption of the prescribed, time-tested, result-getting ACCIDENT PREVENTION SERVICE offered by the National Safety Council. A sound Safety Program is a valuable investment for your company . . . invest in Safety NOW!

UNIVERSAL SAFETY

PAPER and PULP SECTION

To make Council Membership of maximum service, safety administrators of member companies are enrolled in the Industrial Section where their chief interests lie. Safety directors whose companies are engaged in similar operations thus pool their knowledge and experience.

Sectional news letters afford a medium for presenting and exchanging information on specific industrial safety problems and ideas on specific hazards. Section members also cooperate in preparing Safe Practices Pamphlets, Data Sheets, Instruction Cards, etc. The Paper and Pulp Section is extremely active in all Council activities.

For Free Information Write:

NATIONAL SAFETY COUNCIL

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SIMPLE, ECONOMICAL, UNIFORM SIZING FOR PAPER BOARD

the New KELGIN LV

To form a film barrier which controls the penetration of gloss ink, apply KELGIN LV to the surface of the sheet.

Some of the advantages are:

KELGIN LV is easy to handle—soluble in hot or cold water.

Simple calender box application.

Does not cause picking or sticking of sheet to calender rolls.

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Result: A *uniformly* sized paper board, ready for a superior job of gloss ink printing.

Our technical service is offered in commercial applications.

KELCO COMPANY

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DR. MAASS AWARDED MEDAL FOR ACHIEVEMENT IN SCIENCE

Dr. Otto Maass, one of McGill University's most outstanding scientists, has been awarded the Henry Marshall Tory medal for eminent achievement in the world of science by the Royal Society of Canada at its annual meeting in Kingston. The medal, established in 1943 to mark the career of one of Canada's great scientists and administrators, is one of five medals bestowed annually by the Society.

Dr. Maass is Macdonald professor of physical chemistry and chairman of the department of chemistry at McGill University, besides being director of the Pulp and Paper Research Institute of Canada.

◆

NEW APPOINTMENTS IN HERCULES RESEARCH DEPT.

Two new appointments in Hercules Powder Company's Research Department were announced last month. Dr. Robert W. Cairns will be assistant director of research, and Dr. Raymond F. Schultz has been named director of the company's Experiment Station.

Dr. Cairns has had ten years of experience in Hercules research as research chemist, group leader, and director of the Experiment Station. In the latter position, which he held from August 1941 until his transfer to the Research Department last January, he developed a broad background of experience in many phases of chemical research.

Dr. Schultz, who has been acting director of the Experiment Station since the first of this year, joined Hercules in June, 1941, as technical assistant to Dr. Ott. From July, 1942, until September, 1943, he served as assistant director at the Station. Prior to joining Hercules, Dr. Schultz was associated with E. I. du Pont de Nemours and Company as a research chemist, and from 1937 to 1941 he was assistant professor of chemistry at Lehigh University.

◆

▶▶▶ Under the management of *G. N. Streit*, the Detroit branch office of Stein, Hall & Company, Inc., has been expanded. Mr. Streit, who was formerly associated with the Chicago office, has four very capable men on his staff. *M. F. Hunt* covers Stein Hall's general line; *R. Swint* specializes in products for the food industry; *E. B. Taylor* handles general adhesive and paper mill materials; and *H. J. Jones* contacts manufacturers of corrugated board in the interests of the Stein-Hall starch process.

◆

MATHIESON ANNOUNCES TECHNICAL APPOINTMENTS

The newly created position of technical director of The Mathieson Alkali Works has been filled by the appointment of G. P. Vincent, manager of the sales development and technical service department of the company. In addition to his former duties, Mr. Vincent will direct research and technical development and advise on technical matters concerning plant operation. In these latter capacities, he succeeds R. E. Gage, who was director of research and development for Mathieson for 14 years and has now been appointed technical advisor of the company.

G. P. Vincent

R. E. Gage

◆

▶▶▶ At the annual stockholders meeting of Gardner-Denver Company, Quincy, Illinois, *Alfred Kauffmann*, retired president of Link Belt Company, Chicago, was elected a director of the Quincy organization. He succeeds F. H. Gardner, who resigned his directorship because of ill health.

◆

▶▶▶ After being connected with the Pack Demonstration Forest at North Warrensburg, New York, for the past 17 years, *Frank Aldrich* has resigned his position and has accepted the position of forester in charge of forestry operations for the Robert Jares Pulp and Paper Company, Orangeburg, South Carolina.

◆

▶▶▶ Promotions recently announced by Hewitt Rubber Corporation, Buffalo, New York, are: *Joseph H. Hayden* to the position of vice president, and *William H. Watkins*, controller and assistant treasurer.

◆

▶▶▶ At the third-second annual meeting of the National Association of Waste Material Dealers, *Paul J. White* was re-elected president. Mr. White is president of the Great Eastern Packing and Paper Stock Corporation. The Association confined attendance at its thirty-second annual meeting to those members from nearby New York points, in conformance with O.D.T. regulations.

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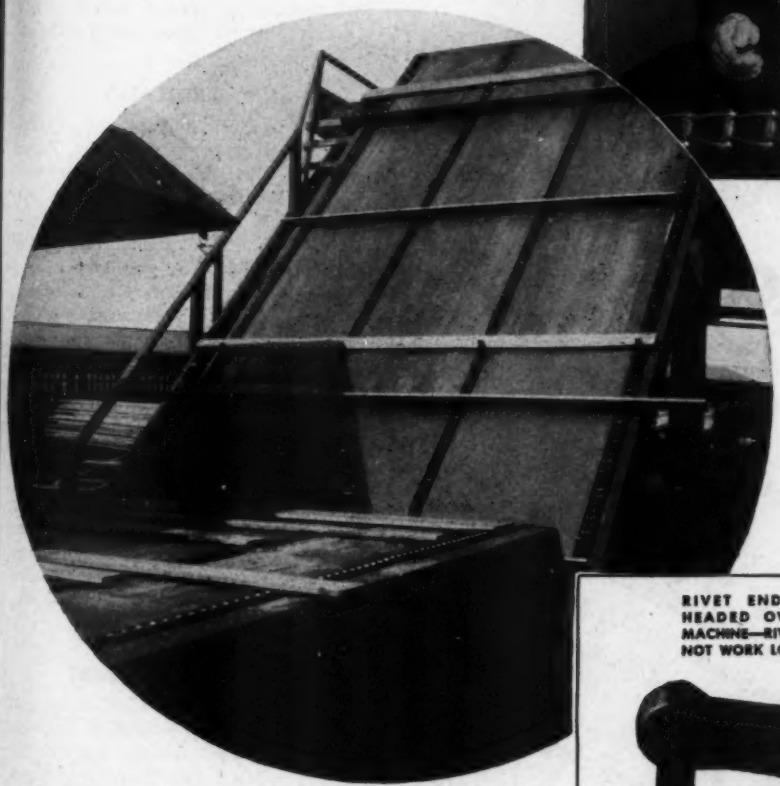
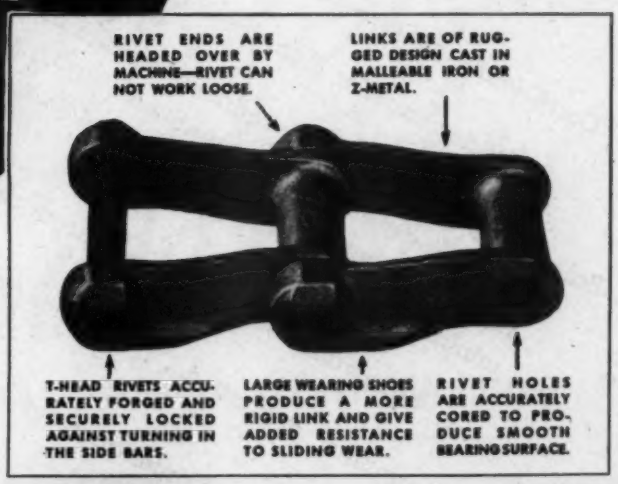
THE CHAIN YOU CAN *"Put Through the Mill"*

① IT'S RUGGED . . . this Rex Riveted Mill chain belt . . . designed to withstand the heavy shock loads encountered in lumber mill drive and transfer conveyor service. It's been "through the mill" and has stayed in service long after other types of chains have failed.



② ON THIS TRANSFER CONVEYOR for example, Rex Riveted Mill chains carry lumber to the sorting table. Their wide wearing shoes are made to order for sliding on floors and runways . . . produce a more rigid link and assure greater resistance to sliding wear. Links are accurately cast in high quality malleable iron; or for extra severe service, they are furnished in Rex Z-Metal, for greater strength and resistance to abrasion and corrosion.


RIVET ENDS ARE HEADED OVER BY MACHINE—RIVET CAN NOT WORK LOOSE.
LINKS ARE OF RUGGED DESIGN CAST IN MALLEABLE IRON OR Z-METAL.
T-HEAD RIVETS ACCURATELY FORGED AND SECURELY LOCKED AGAINST TURNING IN THE SIDE BARS.
LARGE WEARING SHOES PRODUCE A MORE RIGID LINK AND GIVE ADDED RESISTANCE TO SLIDING WEAR.
RIVET HOLES ARE ACCURATELY CORED TO PRODUCE SMOOTH BEARING SURFACE.

③ NOTE THE WAY the T-head of the pin fits into the head lock cast on the link as shown in this close-up. The pin is prevented from turning in the side bar and wear is confined to the wide bearing surface inside the barrel. Note also the fact that rivet ends are headed over by machine . . . can't possibly work loose.

* * *

Rex Riveted Mill chain belts, in either malleable or Z-Metal, are the answer to drive and conveyor problems involving heavy loads or severe service conditions. The Rex Man will gladly help you with your chain belt application problems. For engineering data, write for your copy of the 768-page catalog, No. 444. Address Chain Belt Company, 1114 West Bruce Street, Milwaukee 4, Wisconsin.

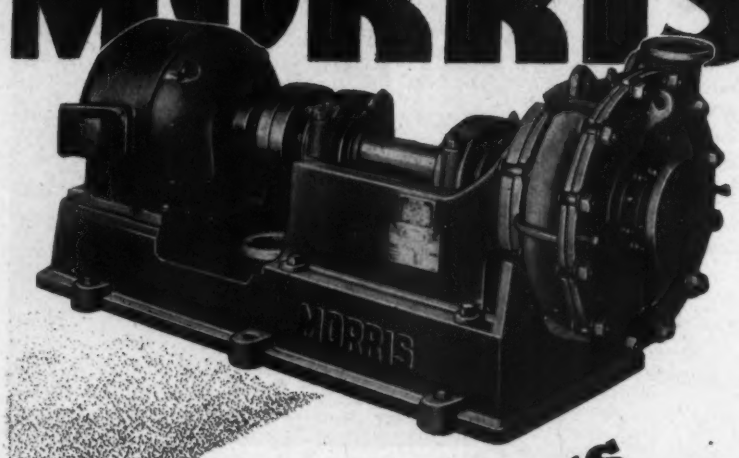
REX **CHAIN BELTS**

Manufactured in every available type for positive transmission of power, timing of operations and conveying of materials.

CHAIN BELT COMPANY OF MILWAUKEE

Rex Chain Belt and Transmission Division, Rex Conveyor and Process Equipment Division, Milwaukee 4, Wisconsin • Baldwin-Duckworth Division, Springfield 2, Massachusetts

MORRIS



Used extensively for handling

black liquors

in paper mills

Consistently out-lasts and out-performs lighter pumps.

Wider impeller clearances cut internal friction.

Balanced pressure impeller reduces leakage and eddy losses —also keeps damaging quantities of gritty particles from circulating between impeller and suction disc liner . . . minimizes wear.

Renewable disc liners and throat ring.

Frequent dismantling prevented . . . service interruptions shortened.

Maintenance cost reduced.

MORRIS MACHINE WORKS

Baldwinsville, N. Y.

Branch Offices in Principal Cities

MORRIS CENTRIFUGAL PUMPS

Necrology

WILLARD J. HENRY

After a long illness, Willard J. Henry, head of the sales department in the Chicago office of Southern Advance Bag & Paper Company, Inc., Hodge, Louisiana, passed away May 23.

Mr. Henry had been associated with Southern Advance company for about 25 years. He was a vice president and director of the company, but he had been inactive for several months. He is survived by his widow and two sons.

◆

I. L. GARTLAND

At the age of 50 years, I. L. Gartland, president of D. M. Bare Paper Company, Roaring Spring, Pennsylvania, passed away suddenly last month.

Mr. Gartland had been president of the company for the past two years; previously he had been vice president. He had been associated with the industry for more than 30 years, during which time he had become one of the prominent members of the technical groups. He was also an experienced, practical papermaker, and had been connected with International Paper Company, Union Bag & Paper Corporation, Port Huron Sulphite & Paper Company, and the Fletcher Paper Company. Before his connection with Bare company, he was general sales manager of Northwest Paper Company.

◆

DR. HAROLD HIBBERT

Former professor of industrial and cellulose chemistry at McGill University and internationally known research chemist, Dr. Harold Hibbert passed away in Philadelphia on May 13 at the age of 67.

Dr. Hibbert was born in Manchester, England and received his early college education at the University of Manchester. After teaching for five years at the University of Wales, he proceeded to Leipzig where he was awarded a Ph.D. degree in 1906. In 1911, he was granted a D.Sc. degree from the University of Manchester, and in 1936 an honorary LL.D. degree by the University of British Columbia. For two years, Professor Hibbert was instructor in chemistry at Tufts College, Boston. Later, he was appointed to the staff of Yale University, remaining there until 1925 when he accepted the chair of industrial and cellulose chemistry at McGill University. He retired from teaching duties at McGill in 1943.

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INDISPENSABLE PRODUCTS *in* PAPER AND PULP PROCESSING

Caustic Soda
Liquid Chlorine
Silicate of Soda
Soda Ash

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PITTSBURGH, PA., *and Everywhere*

ALKALIES

AREA OF LEAK	AIR		STEAM		WATER	
Diameter Inches	Number of cubic feet per month at 75 lb. pressure	Total cost of waste per month 11c per 1000 cubic feet	Pounds wasted per month at 160 lb. pressure	Total cost of waste per month 65c per 1000 lb.	Gallons wasted per month at 60 lb. pressure	Total cost of waste per month 16c per 1000 gallons
1/2"	13,468,000	$1,481.44	1,219,280	$792.53	1,524,100	$243.86
3/8"	7,558,500	831.44	684,290	444.79	855,360	136.86
1/4"	3,366,990	370.37	304,820	198.13	381,020	60.96
1/8"	824,570	90.70	74,650	48.52	93,310	14.93
1/16"	213,000	23.43	19,280	12.53	24,110	3.86
1/32"	52,910	5.82	4,790	3.11	5,990	.96

What does it cost you each month

... for air, steam, water, you never use?

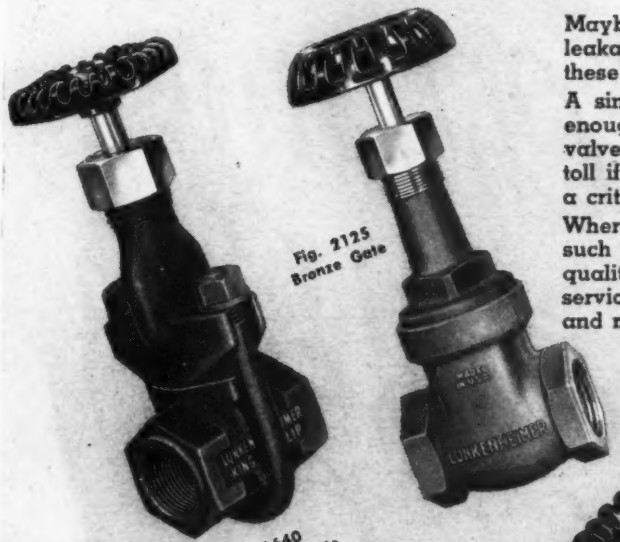

Fig. 2125 Bronze Gate

Fig. 1640 "King Clip" Gate

Maybe you've never checked the actual cost of valve leakage. If you haven't, you'll doubtless be startled at these figures.

A single valve leak the size of a pinhead can waste enough air in a month to approximate the cost of a new valve. Steam leaks . . . water leaks . . . also take a heavy toll if neglected . . . not to mention the wastage of such a critical item as fuel.

Where Lunkenheimer Valves are given ordinary care, such losses are held to an absolute minimum. These quality-built valves are designed to give extra long service with the lowest possible outlay of time, labor, and money, for maintenance.

Enlarged copies of the above chart for posting in your plant are available on request. Also available are the services of your nearby Lunkenheimer Distributor, who is fully equipped to assist in solution of your operating or maintenance problems.

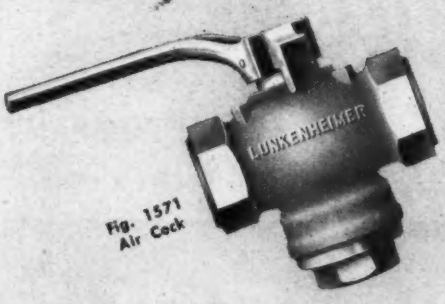

Fig. 1571 Air Cock

Fig. 16-P Bronze Globe

ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

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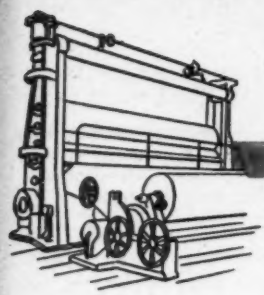
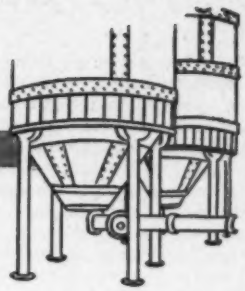
BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S. P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS



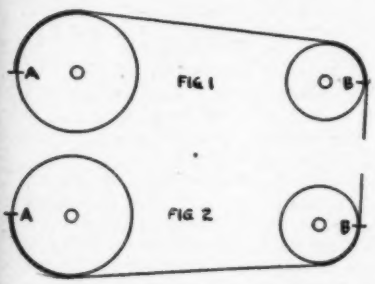
Practical SHORTS



Readers are invited to submit short, practical articles for this department. The items should be original and should relate to ways and means of handling production and maintenance jobs. Where possible, articles should be illustrated. Rough sketches only are required. Payment will be made for acceptable items upon publication.

Quick Measuring Kink

Figures 1 and 2 show how to measure the distance around sheaves, pulleys, drums etc., when measuring for a belt whether flat or V, band saw, rope, cable, apron, etc.



A steel tape is often not long enough to reach clear around. And even if the tape does reach clear around, it often is a cumbersome method on account of obstructions and the necessity of running back and forth with the tape.

Two men can do the job most effectively. One man makes a mark at A and the other makes a mark at B. Measure around the top from A to B, Figure 1; then measure from A to B around the bottom, as shown in Figure 2. Add the two measurements and you have the exact distance around.—W. F. SCHAPHORST, M. E.

◆

Step Ladders

Most step ladder accidents are caused by defects in the ladder or by the climber losing his balance and falling. Here are some important suggestions:

1. Make sure the ladder has no defects.

2. Open the ladder wide enough so that the spreader locks itself in the fully opened position. Avoid step ladders having rope or chain spreaders.

3. If the ladder is placed before a doorway, lock the door or have someone guard it; protect the ladder base from traffic, if necessary.

4. Place the ladder on a firm level base; if blocking is necessary, anchor both blocking and ladder, or tie it in place.

5. Set up the ladder so that you can reach your objective easily; never lean far out from a ladder in any direction.

6. Avoid standing on the top of a step ladder; use a ladder tall enough to let you stand at least two steps from its top.

7. Never use boxes or other makeshifts to increase the height of a ladder; never set the ladder on loose or makeshift supports.

8. Tools should never be left on a step ladder unless tool holders are provided.—*Safety Instruction Card No.* 262, NATIONAL SAFETY COUNCIL.

◆

Care of Portable Electric Hand Saws

Overloading of portable electric hand saws results from mistaken efforts to rush jobs. Overloading can be avoided by a few simple precautions: Do not jam saws into the work, as jamming causes stalling and serious motor strain. Do not start or stop saws while the blade is stalled in the work. Starting or stopping while stalled also throws overload on the switch and will cause quick burn-out. Do not use dull, incorrectly sharpened or poorly set blades, as they not only slow down the work but cause overload by binding in the cut.

Fastest, most efficient sawing is assured only when blades are kept sharp and properly set. This work can be done by any user, and the only tools needed are inexpensive saw sets, micrometer gauges and quality files. After a number of sharpenings in the field, however, blades should be completely reconditioned by a professional man. Since this requires hammering, gumming, setting, jointing and filing, it should not be attempted in the field. Due to the great variety of materials cut and operations done by electric hand saws, a wide range of blades is available.

Using the correct blade for each job avoids the possibility of motor overload and assures the greatest sawing speed. Most widely used of all is the combination blade suitable for both cross-cutting and ripping. Rip blades, cut-off blades, grooving, fine-tooth, mitre, friction, flooring and high-speed hollow-ground blades are available for specific cutting jobs. Abrasive discs are used for cutting concrete, tile, marble, granite, asbestos, cement sheets, cast iron, alloy steels and many other metals and materials.—SKILSAW, INC.

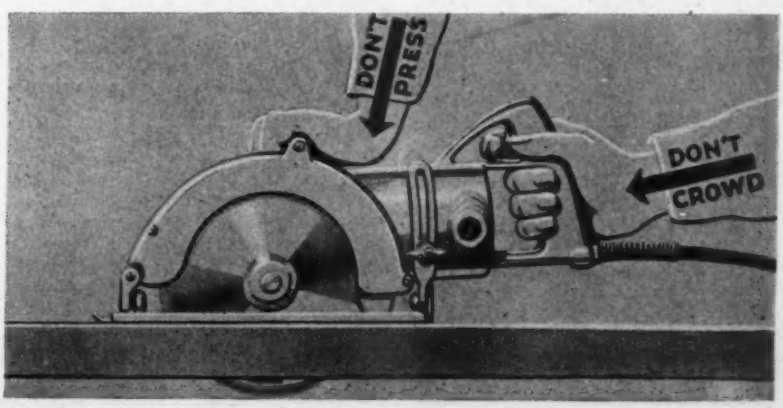
◆

Curing of Linings for Sulphite Digesters and Accumulators

Proper curing or seasoning of new linings in sulphite digesters and accumulators is a preventative against lining failure. Faulty curing may result in complete failure of lining, due to cracking or spalling of the brick before the joint material, especially in the backing, has become thoroughly set. The additional time and effort spent in properly curing a lining will be more than repaid in additional service and lower maintenance costs.

A newly lined vessel should be allowed to season for five full days with the top cover plate off and with an opening in the bottom to the atmosphere to assure proper ventilation within the shell. This air circulation will assist greatly in the proper setting of the brick and the time interval will give the backing brick a chance to set up before heat and pressure are applied. A temperature of around 65 to 70 Fahr. (18 to 22 C.) should be maintained within the shell during this time.

At the end of the five day period, low pressure steam should be admitted through the bottom and allowed to circulate up through the shell and escape through the top opening. The quantity of steam ad-



mitted should be an amount equal to the discharge from a one-half inch pipe opening. A drain and trap connections should be provided at the bottom of the shell and utilized to draw off the condensate.

After twelve hours of steaming, a sulphite lap or a piece of heavy canvas should be thrown over the top opening. Then the temperature inside the shell should be raised gradually and at a uniform rate over a twenty-four hour period to 212 Fahr. (100 C.).

Care must be taken during steaming not to develop any pressure in the shell.

After the thirty-six hour warming period, the shell is ready for service.

In the case of a hot acid accumulator, no further caution is required except raising the pressure in the shell very gradually. This detail is accomplished by filling the accumulator one-third full of raw acid before putting it into service.

In the case of a digester, it is better to continue the steaming operation until ready to fill with chips. The first cook, following this curing procedure of a new lining, should cover approximately eighteen hours, with pressures as follows:

Hour	Pounds Pressure Not to Exceed
1st	3
2nd	8
3rd	14
4th	23
5th	34
6th	45

At 45 pounds pressure, by relieving slightly, the steam may be increased to bring the cooking pressure up slowly to 60 pounds and not above until near the end of the cook, when a maximum pressure of 65 pounds may be carried.

In the next five cooks, the cooking time should be reduced gradually with a corresponding increase in digester pressure until at the start of the seventh cook, normal operation is obtained.—CHEMIPULP PROCESS, INC.

◆

Simple Device Eliminates Shutdowns and Protects Pump

A centrifugal pump on blow pit service was operating to the entire satisfaction of the engineers of a large paper mill. Shutdowns and delays were occurring, however, because a brick or two from the lining of a digester would work loose occasionally and, being too large for the pump opening, would clog the pump. A simple device eliminated the trouble. The sketch is self-explanatory.—GOULDS NEWS.

Check for Minor Belt Repairs and Pulley Alignment

Regular and frequent check of belts to note and care for even slight repairs may add to their service-life. Check for misalignment of pulleys and shafting and make adjustments as needed so the belts may continue to run true and give maximum service. Don't let the belts rub against beams, shifting forks, pipes or anything lese.—SAMUEL L. ALLEN.

◆

Method for Testing Static Conductivity of Rubber Belts

An easy method to determine whether any rubber V-belt, flat belt, hose or other product is static conductive has been developed by technicians of The B. F. Goodrich Company.

A simple assembly, using a five or six foot length of lamp cord with standard rubber socket plug, a two-watt Neon bulb, two ordinary clamps or metal prongs and two insulated handles can be readily constructed for the tests.

One of the wires of the cord is cut, the Neon bulb inserted in a standard base, the insulated handles installed near the end of each wire and the prongs or clamps attached to the wires.

To make a test, part of the belt or other rubber product is moistened with water, leaving a dry section eight to twelve inches long between the moistened surfaces, the testing assembly is plugged into any 110 volt alternating current line, and the clamps or prongs applied to the moistened surfaces, with the dry in the middle.

If the bulb glows, the rubber product is a static conductor.

The belt or other article under test must be suspended in the air between the clamping points, or rest on a table or other surface which has been insulated so it is non-conducting.

All static conductive rubber belts should be tested for conductivity at regular intervals of at least once monthly.—THE B. F. GOODRICH COMPANY.

◆

Gasket Materials

Some of the materials that are normally available for use as gaskets either alone or in combination with each other are listed below:

Non-metallic Materials

Asbestos Millboard
Asbestos Paper
Asbestos Cord
Blue African Asbestos Cord
Woven Asbestos—plain or rubberized
Woven Blue African Asbestos
Compressed Asbestos—sheet packing
Canvas
Felt
Vegetable Fiber
Soft Fiber
Hard Fiber
Cardboard
Paper
Leather
Cord
Glass Fiber
Soft Rubber
Hard Rubber
Cloth Inserted Rubber
Synthetic Rubber

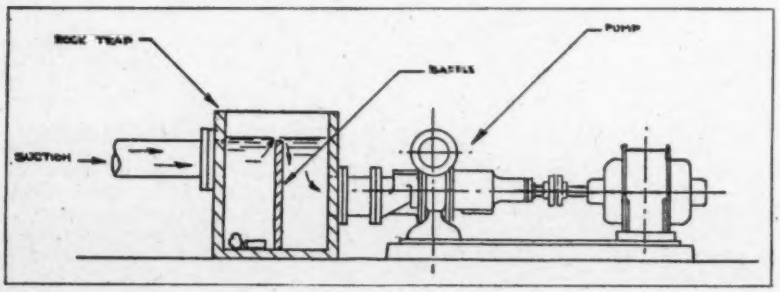
Semi-metallic Materials

Woven Asbestos—wire inserted
Laminated Steel and Asbestos

Metallic Materials

Pure Lead
Antimonial Lead
Hoyt Metal
Block Tin
Zinc
Aluminum
Copper
Brass
Terne Plate
SAE—1010 Steel
SAE—1020 Steel
Type 502—4-6% Chrome ½% Mo Steel
Type 410—11-14% Chrome Steel
Type 304—18/8 Stainless Steel
Type 316—18/8 Stainless with Molybdenum
Type 347—18/8 Stainless with Columbium
Admiralty Metal
Silver
Bronze
Platinum
Phosphor Bronze
Everdur
Tantalum
German Silver
Gold
Nickel
Monel
Inconel
Armco Ingot Iron
Rema Iron
Copper, Chromium, Nickel, Cadmium, Zinc and Silver Plating

—GOETZE GASKET & PACKING CO., INC.



Do's and Don'ts in the Care and Operation of Portable Electric Tools

— DO —

1. Keep tools clean and protect cords against grease, oil, cuts and kinks.
2. Use proper lubricants.
3. Inspect brushes regularly.
4. Keep all screws and nuts on housings tightened.
5. Keep bits and blades sharp.
6. Use correct tool and accessory for each job.
7. Check voltage before connecting tool.
8. Have tool properly grounded.
9. Wear safety goggles and respirator where dust, sparks, chips and dirt are a hazard.
10. Call on your Supplier for aid on unusual jobs.

— DO NOT —

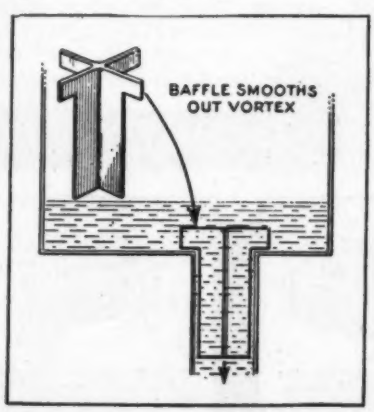
1. Operate tool on low voltage.
2. Use incorrect gauge extension cords.
3. Start or stop tool in the work.
4. Carry or pull tools by cords.
5. Use over-size drill bits.
6. Exert extra pressure on sanders and grinders.
7. Crowd saws into the work.
8. Use odd or incorrect lengths of sanding belts.
9. Allow chucks to be bumped or knocked.
10. *Attempt major repairs—but use authorized service stations for such jobs.*

—SKILSAW, INC.

◆

Baffle Eliminates Suction Trouble in Partially Filled Supply Tanks

Frequently, trouble is experienced in the operation of a pump when the suction is from a tank above the pump, and the level of the liquid in the tank is somewhat low. The liquid flowing down the pipe will form a vortex of whirlpool immediately above the pipe. When the capacity of the pipe is large and the depth of liquid in the tank relatively shallow, air will be taken into the suction pipe.



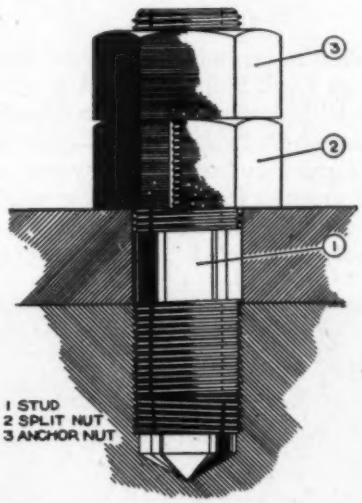
If a centrifugal pump is used, it is likely to become air bound. Operation is impaired, and often the pump will run dry, with the resulting seizure of parts necessitating expensive repairs. If a reciprocating pump is in service, the cylinders will not fill, which will cause pounding and eventually mean damaged valves, valve seats, etc.

A simple welded baffle, which can be made in any maintenance shop from scrap sheet steel, will usually help smooth out the vortex. Its size, of course, will depend upon the suction pipe diameter and the depth of liquid in the tank. This inexpensive fixture is well worth trying where trouble has been experienced from the above mentioned cause. Although the application illustrated shows baffle for use where tank is above pump, the same principle can be applied in other types of installations where a vortex forms at the suction pipe entrance.—GOULDS NEWS.

◆

Stud Removing Simplified

A self-locking jam nut is used at General Electric's Erie Works to remove studs without damaging the threads.



Two standard nuts—one slotted lengthwise—are backed against each other. The pressure of a wrench on the split nut binds it to the stud threads, providing extra friction by which the stud may be removed. The second nut is used as an anchor.—GENERAL ELECTRIC CO.

◆

Coal Storage

Don't store more coal than you need or can handle safely. Nut-and-slack and slack sizes should be stored in layers 3 or 4 ft. thick and each leveled and rolled hard with a bulldozer.

Store on clean, hard, well-drained ground. Don't pile against buildings or fences. Don't store in conical piles if possible to avoid it.

Segregation of coarse and fine coal is a major cause of storage fires. Coarse, double-screened coal, such as nut, stove and egg sizes, should be handled carefully when stored to prevent pockets of fine coal. Here, pile loosely and ventilate as much as possible, *a procedure opposite to that used when storing coal containing fines.*

Storage-pile fires waste thousands of tons of coal annually, yet they are almost always preventable if coal is stored and reclaimed with care. When reclaiming coal from a storage pile, if practicable, cut squarely across the pile, beginning at one end and working toward the other. If hot spots develop, remove the hot coal and burn it at once. Check pile temperature frequently for the first 60 days, or until no further temperature rise above 150 to 160 Fahr. is noted.—R. F. STILWELL.

◆

To Test a Scaffold Plank

Block it up a foot from the ground placing the supports the same distance apart as the scaffold supports on which it is to be used. Now load the plank with three times the load it will be required

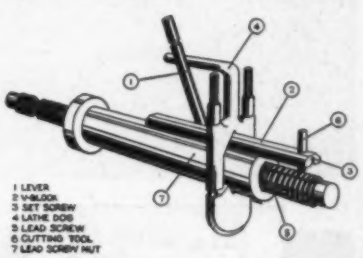
to support in actual use placing load as close to the center as possible. At the slightest sign of weakness, discard the plank and mark it so no one else will use it is a scaffold plank.—*Safety Instruction Card No. 15,* NATIONAL SAFETY COUNCIL.

◆

Repairing Machine Lead Screws

A quick and easy method of reconditioning damaged threads on lead screws, deformed either by accident or normal wear, has been devised by Clifton Roberson, a maintenance man at General Electric's Erie Works.

In this method, a lathe dog (4) clamps a V-block (2)—machined to hold a cutting tool (6)—to the land screw nut (7) In effect, the nut becomes a die with a single point cutting tool when a tool bit, ground to fit the thread, is inserted in the V-block and locked with a setscrew (3).



The tool will clean burrs and bumps preceding the nut, which is held stationary by a long lever (1), while the screw (5) is driven by a lathe.

Since the few shops are equipped to machine such long pieces, the usual procedure is to file off the deformities. This involves considerably more time than the proposed method of repair, which can sometimes be performed without disassembling the screw.—GENERAL ELECTRIC CO.

PULP AND PAPER MEN ARE "A Revolution in

First Commercially Developed Hydraulic Barker for Pulpwood... Revolutionary Allis-Chalmers "Streambarker"... Can Save Average U.S. Mill $69,000 a Year in Brooming Losses Alone!

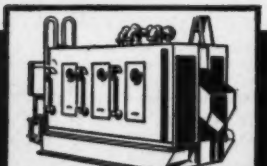
LOOK AT THE FIGURES: Based on recent industry statistics, the average U. S. Pulp Mill uses 48,142 cords of "rough" pulpwood annually. Brooming losses run anywhere from 2% to 15%. 6% is typical, figures out to 2,888 cords. At $24 a cord, that means a total loss of $69,312 a year through brooming alone *... a loss which can be entirely eliminated with new revolutionary "Streambarker"!*

And if you add *other* important Streambarker benefits — in manpower, space and cost — the final saving can be even higher!

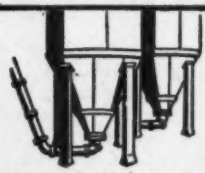
Why not substitute *your own* figures ... see how much the new A-C "Streambarker" can save for *you!* Send for Bulletin B6341. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

NEW STREAMBARKER is Allis-Chalmers' answer for removing bark from pulpwood sticks — 4 to 8 feet long, from 4 to 18 inches in diameter — by means of water under high pressure!

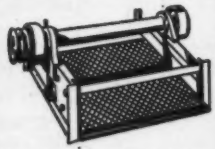
In *one* U. S. mill, an average of 14 cords of pulpwood per hour is being passed through "Streambarker"... with *no* brooming; sticks barked *clean,* with *no* dirt, *no* rot! The machine is running 24 hours a day, and the 14-cord average is based on 90, 4-foot sticks per cord!



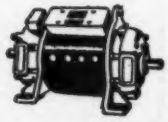
PREPARATION — Hydraulic Barkers, Chip Screens, Saws, Slashers, Interplane Grinders.



COOKING — Digesters, Blow Tanks, Kilns, Slakers, Heat Exchangers, Condensers.



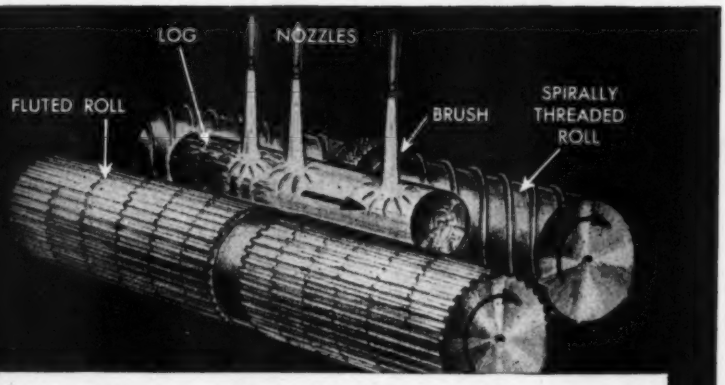
WET ROOM — vibrating-type screens for use as Thickeners, for dewatering rejects.



PAPER-MAKING — special design Drives for Paper Machines, Rewinders, Calenders.

ALLIS A-C CHALMERS

CALLING IT Barking"



HERE'S SECRET OF STREAMBARKER! Water, forced at 650 lbs pressure through 3 specially designed nozzles, *rips off bark by erosive action* as log is revolved and propelled through machine by two bed rolls — one fluted, the other spirally threaded.

Here's What "Streambarker" Means to You:

1 **BIG PRODUCTION** — at least 10 cords per hour, based on 90, 4-foot sticks per cord!

2 **LOWER PULPWOOD LOSS** — 150 ton mill can save $100,000 a year in brooming losses alone!

3 **SAVINGS IN MANPOWER.** For example, one 100 ton mill has been able to transfer 9 men from woodroom to other important jobs!

4 **LOWER COST** — initial and installation cost is less than for conventional barking equipment!

5 **COMPACTNESS** — valuable space in wood room can be converted to more profitable use!

6 **BETTER QUALITY PULP** — because wood through "Streambarker" is sound, clean—free from dirt and rot!

7 **SPEEDED OPERATION** — lower dirt count means less work, more speed for diaphragm screens!

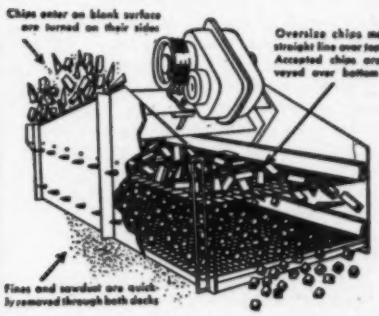
8 **GREATER PROFITS** — it all adds up to lower costs, better pulp quality — and most important — bigger profits for you!

A 1845

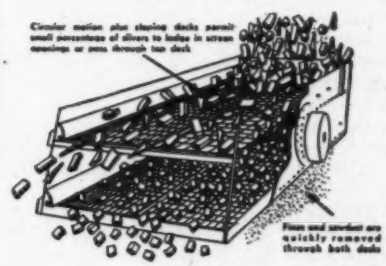
DEVELOPMENT NEWS

THE GROWING TREND toward use of Vibrating-type Chip Screens in existing and new mills indicates eventual *standardization* on this newer type by the industry. Four main reasons which have been responsible for this increased acceptance are: 1) Vibrating Chip Screens *cost less* than conventional revolving or shaker-type screens; 2) they take *less* space; 3) they require *less attention;* 4) they do a *better, faster* separation job than conventional screens.

Here are two *different* Vibrating Chip Screens which Allis-Chalmers offers:

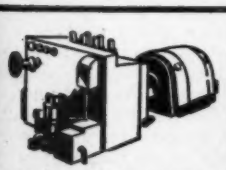

Chips enter on blank surface are turned on their sides
Oversize chips move in straight line over top deck. Accepted chips are conveyed over bottom deck
Fines and sawdust are quickly removed through both decks

LOW-HEAD HORIZONTAL-TYPE Chip Screen — Its 45° straight-line vibratory motion in combination with horizontal decks assures the *highest percentage* of uniform chips. Reason is that all chips are carried in a straight line, *on their sides* — acceptable chips passing through, rejects and long slivers passing over, top deck.


Circular motion plus sloping decks permit small percentage of slivers to lodge in screen openings or pass through top deck
Fines and sawdust are quickly removed through both decks

RIPL-FLO INCLINED Chip Screen — Circular motion in combination with inclined decks assures an *average percentage* of uniform chips. Reason: a *small* number of slivers tend to turn on end and lodge in screen openings or pass through top deck and combine with accepted chips.

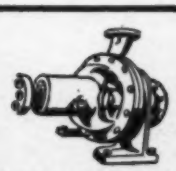
Send for Bulletin B6353 for *facts* to help you select the Screen that's best for you.



POWER — all types of Power Generation, Distribution and Control Equipment.

MOTORS & CONTROLS — all types a-c and d-c Motors, ½ to 7000 hp — Gearmotors.

TEXROPE V-BELT DRIVES — fractional to 5000 hp — Constant and Adjustable speed.



PUMPS — Single & Multi-Stage, 10 to 150,000 gpm — Paper Stock Pumps, Fan Pumps.

MILWAUKEE 1, WIS.

Paper Under Price Control

E. W. TINKER

Executive Secretary
American Paper and Pulp Association

▶▶▶ I have read with a great deal of interest the recent article by Mr. J. R. Atwater, "The Paper Industry Under Price Control." In this article Mr. Atwater refers to the remarks made by me last January in discussing the same subject. Since Mr. Atwater essentially agrees with the factual basis I used, it seems to me that the subject deserves further consideration. Certainly his clear-cue statement of the Office of Price Administration's pricing policy as applied to the pulp and paper industry was welcome indeed.

The Office of Price Administration has allowed increases in raw material prices and, following its usual procedure, has attempted to suppress advances in the price of the finished product. This has created an anomalous situation because there has been an increase of fifty per cent in labor costs per ton of paper which, in addition to the raw material increases which have been allowed by the Office of Price Administration, appear to lead to the necessity for some definite remedial action. There must come a time, if it has not already passed, when increased costs of raw materials and increased compensation for labor, add up to the point where in all equity the manufacturer of paper must have some relief. I repeat that the situation has only been possible because the manufacturers, in an effort to survive, have increased production, partially through patriotic motives and partially because it was the only thing they could do and continue to exist. Allowance of a survival incentive has been cold comfort in view of depreciation and obsolescent factors that have not yet appeared in the picture but that will be very real after the war. It is a fact that labor costs per ton have advanced 50 per cent and also that average weekly wages have advanced far more than the advance in cost of living. If, as is contended by many, the "take-home pay" should be the controlling element rather than weekly wages, then by the same token, net profits after taxes should be the criterion for the manufacturer, and these have been steadily declining since 1941. I can think of nothing more deadening to incentive and the investment of risk capital than a policy that in its broad aspects offers no reward for efficiency, ingenuity and courage.

We have seen an unusual economic phenomenon in this industry since 1941; that is a steady increase in sales accompanied by an equally steady drop in profits. Mr. Atwater admits this to be true and it is the fundamental reason for my fear that if the present trend is allowed to persist serious production difficulties will result.

E. W. Tinker

In Mr. Atwater's article he poses the question of "determining where price ceilings truly constitute a block as opposed to other limiting factors such as material or labor shortages." He goes on to say that "where it is primarily a matter of shortages, a price increase has an inflationary effect without assisting the production program...." I fully recognize the difficulty of these questions. It is frequently most difficult to know when an increase will bring the desired results. But isn't the fact that, as Mr. Atwater points out, grade shifting has been taking place, rather clear evidence that the production program has been interfered with?

The article under discussion compares the position of price indexes of the paper, pulp and paperboard industry groups. It is an interesting comparison but is it to the point? Pulp production is a difficult stage in the manufacturing cycle of paper and paperboard. Furthermore, my previous remarks dealt with the paper and pulp industry which the American Paper and Pulp Association represents. The paperboard industry has other and able representation. I submit further that a price index which averages paper, pulp and paperboard, has small significance when dealing with these problems.

The accompanying chart shows a split up of the Bureau of Labor Statistics Index, used by Mr. Atwater, into its components, Paper, Pulp and Paperboard. It is obvious that the paper series is most out of line as compared with 1939.

For purposes of comparison we have added the all commodity index of wholesale prices of the Bureau of Labor Statistics. Taking August, 1939 as the base for all of these indexes, the all commodity index rose above the paper index early in 1941 and has been above it ever since. The relative position, February, 1945, is:

all commodity 140.2
paper 120.1

Thus, since August, 1939 the paper price index has increased only 20 index points while all commodity prices have been rising 40 index points.

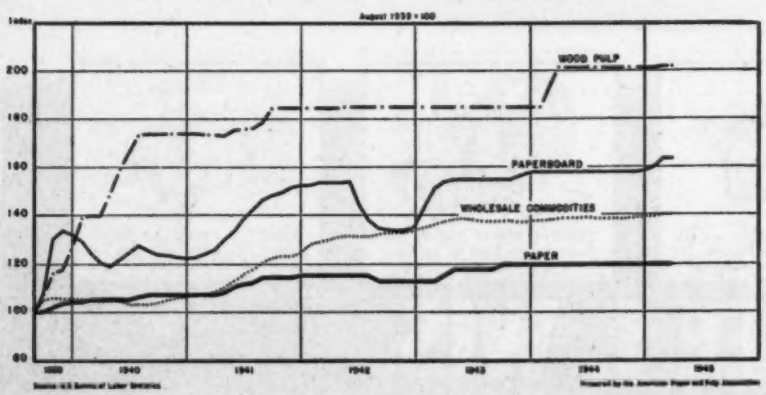
Comparison with 1941 Prices

If the changes since October, 1941, are considered, the difference is relatively greater. In October, 1941, the paper index stood at 115.1 and the all commodity index at 123.1. Thus the paper price index has risen 5.0 index points, and the all commodity index has risen 17.1 index points, or more than three and one half times the paper increase during this period of so-called price stablization.

I do not wish to be understood to be opposing the increases in pulp and paperboard prices. All my information is to the effect that the increase so far granted in pulp prices has been justified; in fact it has been less profitable than other products of the industry. The profit position of both market mills and integrated mills has not been encouraging on a comparative basis. The fact that a large volume of pulp is imported may have been a factor in the increases allowed on wood pulp ceiling prices under the Office of Price Administration formula. That present wood pulp ceiling prices are not excessive seems to be confirmed by the recent discussion of price ceilings with the Scandinavian pulp producers.

But I am still convinced that paper prices are out of line as compared with the changes in the general price level. Furthermore, I believe that the discussion by Mr. Atwater, added to the above facts, confirms this position.

INDEX OF PULP AND PAPER PRICES RELATED TO WHOLESALE COMMODITY PRICES



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RCI

for greater wet strength

at least cost

P-426 BECKAMINE

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Although this product comes under WPB allocation, ordering is simple and orders for most end uses are being approved. Simply fill out WPB-2945 forms stating the name of the resin (P-426 Beckamine) and the intended end use. Then send 3 copies to WPB and one to our Sales Department with your order. Shipment will be made as soon as we receive WPB approval of your order.

Strength—the greatest possible strength with economy—governs paper makers' choice of P-426 Beckamine. This highly favored urea formaldehyde resin is a dependable product, stable in storage. You can definitely rely on it for exceptional results—greater wet strength, as well as tensile strength, fold and Mullin. There are no complications in the use of this standard material which is easily applied directly in the beater, fan pump, or the head box. It can also be applied to the sheet at the size press. Write to the Sales Department in Detroit.

Saturday Evenings at 8:30 (E. W. T.)
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SYNTHETIC RESINS • CHEMICAL COLORS • INDUSTRIAL PLASTICS • INDUSTRIAL CHEMICALS

The South Has a Third Major Crop*

DR. WILSON COMPTON,
President, State College of Washington

▶▶▶ THE SOUTH HAS 36 per cent of the commercial forest area of the United States. These lands today hold a fourth of the nation's saw timber supply. Forty years ago the South was producing over 40 per cent of the national production of lumber and timber products. It is still producing that proportion; temporarily in war-time a little more.

Beyond the thousands of its sawmills, the South now sustains 48 great pulp mills. Most of these have been built since 1920. Now that practical methods have been developed for pulping hardwoods as well as pine, the wood supply in the South is sufficient to sustain a pulp capacity twice its present volume. The pulp industry in the last quarter century in the South has advanced from a basis of 400,000 cords of pulpwood annually in 1920 to 6 million cords annually, a 15-fold increase which again may be doubled.

But there is an even greater opportunity in the South in wood conversion. Eventually it should not only provide employment opportunities to replace the waning cotton, but also, over a period of years, it should contribute to the restoration and improvement of the forests . . . the South's one greatest, renewable resource. Many in the South have grown up within sight of sawdust piles, slab pits, and wood refuse burners. They are taken for granted as an essential part of a great industry which, after all, has provided much of the backbone of the development of the South.

What do you see when you look at a pile of sawdust? I have asked that question of hundreds of people in the West and the South. Most people answer: "I see a pile of sawdust." Some say: "I see a lot of good stoker fuel." But that is not what I mean. When you look at a ton of sawdust you are looking at over 1,100 pounds of wood sugar, the same kind of sugar, by the way, which you put in your coffee this morning. You are looking, too, at about 600 pounds of a brownish, blackish substance called lignin, which experts say may have many of the mysteries of the "benzene ring" which is at the foundation of our modern great chemical industries.

Or if you are not interested in the wood sugar itself, it may be converted readily and at low cost into 55 gallons—maybe more—of ethyl alcohol, not the "wood" alcohol which you shun, but the same kind of alcohol which is found in certain beverages, the same alcohol which familiarly comes from Caribbean molasses, or now more expensively from the fermentation and distillation of grains. Or you may have the alcohol in the form of synthetic rubber for your tires or your overshoes. I myself have a pair of good overshoes which once was a pine tree or a fir tree, I don't know which.

Or, if you are interested not only in alcohol or synthetic rubber but also in improving the feeding of livestock, you may see also in this ton of sawdust 300 to 400 pounds of a feeding yeast of a protein content higher than oil meal or oil cake and apparently at a lower cost. Taking wheat at a dollar a bushel and sawdust at four dollars a ton, it would take 8 dollars worth of wheat to furnish as much carbohydrate as one dollar's worth of wood. There are many other factors involved, of course, as the organic chemist will promptly point out, but this margin of eight to one is big enough for somebody with constructive imagination to work on. Some day somebody will, and that will be a day of thanksgiving for the South.

In woods operations throughout the United States, large and small, there is annually a volume of between 50 and 60 million tons of wood which is not now utilized for any important purpose. Much of it is not used at all. This is, of course, an adventure in astronomical statistics, but this amount of so-called "wood waste," if it were converted by present known and proven processes, would produce 33 million tons of wood sugar, which is as much as the present world total production of sugar of all kinds from all sources. Or it would yield over 3 billion gallons of alcohol, thrice our present national alcohol production for all purposes. Or it would provide nearly 10 million tons of feeding yeast sufficient for the livestock of this country and Europe combined. And it would provide 20 million tons of lignin which, if it cannot be used in the production of perfumes, extracts, water purifiers, and the like, can at least be used, as it has been used on a large scale in Europe as a road binder or a soil fertilizer or, perhaps, a glue.

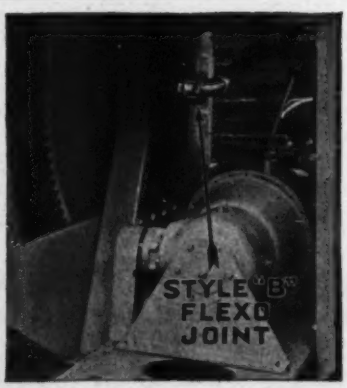
I mention these staggering figures not because any such approach to complete timber utilization may in fact be expected now or later, but because there is so vast a difference between our present 30 per cent utilization of our timber and the 60 or 70 per cent utilization to which science has already opened the door; and because that extent of improved utilization, if established in the forest industries in the South alone, would provide permanently more employment for more people and at higher wages than have ever gained their livelihood from the production of cotton in its most confident days.

The name of Charles H. Herty is one of the most respected names in the annals of science and industry in the South. Dr. Herty's faith in the chemical future of southern pine has been vindicated by the achievement in recent years of a successful newsprint industry in the South, a development which over the years undoubtedly will be multiplied throughout the South. I knew Dr. Herty. I have sat on the same end of a log with him. I have been in his modest laboratory. Latterly I worked with him in the National Recovery Administration. He had hope; he had patience. Above all, he had faith. In 1938, testifying before a U. S. Senate Committee, he said:

"I am an optimist on forestry in the South. There is a simple foundation for my optimism. Here in the South we have 200 million acres of land not needed for agriculture or for town expansion. Every acre of this will grow timber and, *if properly protected from fire and properly managed*, can yield a cord an acre per year. Two hundred million cords is a goal that we can look forward to, *if our people are educated*."

At that time the Senate had before it a forecast for 1950 of a total national consumption of 25 million cords of wood

(*) Released by National Lumber Manufacturers Association, Washington, D. C., May 16, 1945.



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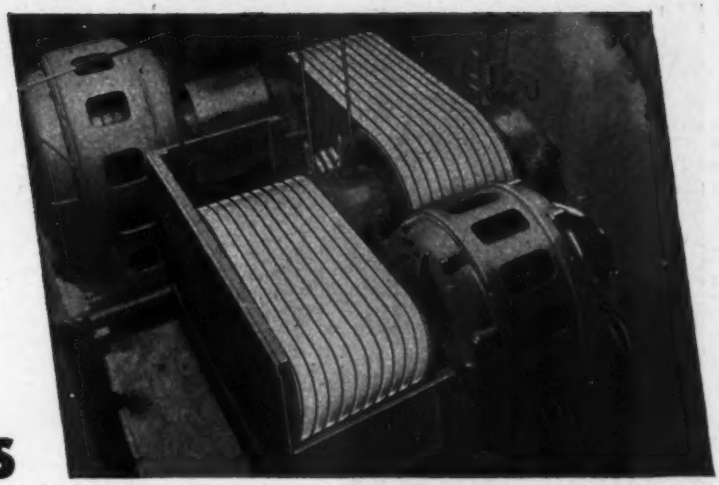

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for pulp and paper in the United States, a quantity which in Dr. Herty's vision, and under conditions of forest protection and management no more favorable than can readily be brought to pass through intelligent public and private co-operation, may eventually be supplied many times over in southern pine alone.

A few days ago in the Congress of the United States the Honorable Harris Ellsworth, Congressman from Oregon, speaking on the subject, *New Jobs Grow on Trees*, threw this challenge not only to the Pacific Northwest which he so capably represents, but to the South as well:

"Present employment in the manufacture of forest products is estimated by the Forest Service at 3,500,000. If, by turning to account what has heretofore been regarded as waste wood, the total forest production figure is increased even 10 per cent—a modest goal—some 350,000 more jobs will be provided in the postwar era. This I consider a minimum figure; other estimates place the potential increase in employment as high as 2,000,000.

"During recent years, particularly the war years, important strides have been taken toward utmost usefulness from the produce of our greatest, renewable natural resource—the forests. Yet an uncharted continent lies ripe for exploration by research, and the reward will be new products, new industries, and *new jobs*. The challenge is so compelling and the prize so rich that we should think of the forest products research program on a national scale."

Our forest industries, I am proud to say, are gradually learning that their future is to be written in the chemist's test tube as well as with a sharp saw; that an industry which eventually must grow its own raw materials had better find out how practically and profitably to use more than a third of the timber which it grows and cuts and sells; and that, with the aid of ingenious science and patient research, the future of forest enterprise in this country may be far greater than its past.

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WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

Convention Papers . . . Abridged

The abridgments in this section are from papers presented "by title" at the annual meeting of the Technical Association of the Pulp and Paper Industry, held in New York City, February 19, 1945.

Laminants and Coatings for Papers, Plastic Films and Metal Foils*

F. B. SPEYER
American Resinous Chemicals Corp.

Compatibility between base resins, plasticizers, and solvents, as well as between plastic films and adhesive composites can be generally predicted on the basis of agreement or likeness in molecular size and structure, special arrangement, atomic structure, and physical and chemical properties. A formulation may be made up simply by mixing two or more materials together, by reacting compounds together, or by any combination of the two methods. The blending together of two or more materials is generally accomplished when there is a similarity in component parts.

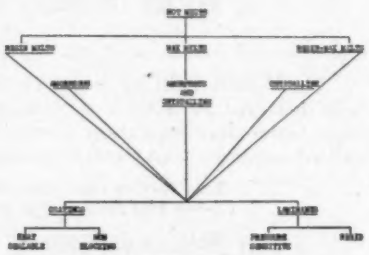

Fig. 1—Hot melt subdivisions

In formulating, it is well to keep in mind the various types of materials which may be incorporated into a formula to give special properties. Table I presents a list of such materials. Table 2 presents a list of specifications which may be

(*) This paper was presented "by title" at the annual meeting of TAPPI, held in New York City, February 19, 1945. It also was presented at the April 16, 1945, meeting of the Chicago Professional Paper Group in Chicago.

TABLE I

MATERIALS USED IN RESINOUS FORMULATIONS

Base Ingredients	Solvents	Plastifying Agents	Miscellaneous
Resins	Organic Solvents	Plasticizers	Tackifiers
Rubbers	Water	Oils	Emulsifiers
Asphalts	Acids	(Vegetable)	Curing agents
Waxes	Alkalies	(Mineral)	Thickeners
Starches	Ammonia	(Animal)	Pigments
Lignin		Greases	Dyes
Casein		Liquid Polymers	Antioxidants
Zein			Binders Inorganics

PAPER

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TABLE 2

SPECIFICATIONS

Resistance to Physical Effects:
1—Shock. 2—Abrasion. 3—Tear. 4—Flame. 5—Heat. 6—Electricity. 7—Infra red and ultra violet rays. 8—Volatilization. 9—Settling (precipitation or coagulation).
Resistance to Chemical Deterioration:
1—Water and water vapor. 2—Organic solvents. 3—Acids. 4—Alkalies. 5—Grease and oils. 6—Oxidation. 7—Gases (O_2, O_3, Cl_2, CO_2, etc.). 8—Other chemicals.
Miscellaneous Properties:
1—Color. 2—Odor. 3—Taste. 4—Toxicity. 5—Flexibility. 6—Resistance to attack of microorganisms. 7—Viscosity. 8—Adhesion. 9—Cohesion. 10—Hardness.
Properties Specific for Coatings:
1—Block point (lb./sq. in.°F./24 hrs./% R.H.)
2—Heat sealability (maximum seal strength when sealed at °F. gives bond of lb./in.)
3—Gloss and slippage.
Properties Specific for Laminants:
1—Pressure sensitivity. 2—Solvent retention.
Properties Specific for Hot Melts:
1—Melting and softening point. 2—Temperature at application fluidity.
Sales Specifications:
1—Cost. 2—Availability. 3—Applicational equipment. 4—Shipping containers.

achieved and may be considered a checklist for evaluating the usefulness of a particular formula.

Coatings are designed to impart to a surface protection, decoration or a means of combining, as by heat sealing, to a second surface. Table 3 presents a list of typical surfaces to which adhesion of a resinous composite is commonly sought. Protection to a surface is brought about by imparting the characteristics of the covering film. A purely decorative coating is designed to enhance the eye appeal of the material to which it is to be applied, however, this property is usually combined

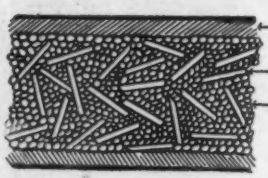

Figure 2

with that of surface protection. Decorative films may be designed to increase gloss, luster, or brilliance to the surface or to impart color, fluorescence, odor, or even taste. In short, any property of a coating which enhances, accentuates, or in any way adds to the basic design and character of the surface, distinguishes the coating as decorative in nature.

Surface coatings may be applied by brushing, calendering, dipping, spraying, or by a coating machine.** The most rapid and uniform method is by use of a coating machine. Spraying may be used to advantage, on rigid or discontinuous surfaces when the fluidity of the lacquer permits. Both heated and cold lacquer sprays are used; the former has the advantage of faster drying resulting in less running. Pieces of leather, paperboard, metal, and other discontinuous surfaces can be sprayed to advantage. Most of the smooth surfaces satisfactory for spraying can be brushed, but this is a slower method and often results in streaks. Usually only solutions too heavy or stringy for a spray gun are brushed. Dipping requires little technique and affords a rapid method for completely coating small objects. Calendering is another rapid method for continuous coating but finds limited application.

Hot melts may be formulated for use either as coatings or as laminants. As coatings, they must necessarily be more tack free to eliminate blocking against either like or unlike surfaces, except in such rare cases where this is desired, such as on fly papers. Blocking is a major problem since coated papers, films, and foils are usually stored and shipped in rolls or piled one on top of the other. Rigid specifications in regard to both temperature (Fahr.) and pressure (psi/24 hr.) are prime requisites of hot melt coatings. Blocking is also affected by humidity factors, high humidities invariably causing a lowering of the block point. On the other hand, heat sealability may be desired, and this is in itself a fusion or blocking of one surface to another. The optimum condition would be a surface whose seal strength was at a maximum when sealed at a temperature just above that where no blocking occurred at the greatest load. Heat sealability is a function of the following factors: (1) Type of resin, (2) type and amount of plasticizer, (3) type and amount of antiblocking agent, (4) type and amount of other incorporated materials, (5) solvent retention, (6) temperature, (7) pressure, and (8) time of dwell.

Hot melts must be formulated not only with regard to meeting the specifications of a finished product but also to conform to methods of application. Thus, flow temperature, viscosity, decomposition, volatilization, stringiness, storage containers, and other such factors must be considered.

A second type of hot melt is the heat and/or pressure sensitive type. When lamination immediately follows coating, blocking need not be considered. The greatest advantage of pressure sensitivity, whether application is made from a solution or as a hot melt, is better low temperature flexibility. When equipment is available, a hot melt or dry coating can be laminated to a similarly coated surface or to another surface by means of heated rollers under slight pressure.

Figure 1 shows further subdivisions into which hot melts may be classed. Water vapor impermeability, fluidity, and softness are generally gained by the waxy type melts, but resistance to abrasion, grease and oils; adhesion and low temperature flexibility are sacrificed. Table 4 lists some of the advantages of hot melts over solution coatings.

Table 4—The Advantages of Hot Melts Over Solution Coatings

A. Absence of flammable and toxic solvents.
   1. Eliminates installation and operation of costly solvent recovery systems.
   2. Better working conditions.
   3. Rigid fire regulations may be lessened.
B. Elimination of active solvent effects on plastic films.
   1. Retained solvents cause softening, wrinkling, and shrinkage in many films.
C. Reduction of shipping weight and absence of limiting shipping regulations.
D. Use of non-breakable and non-returnable containers.
   1. Glass often used in shipping solutions.
   2. Drums must be purchased or returned.
   3. The Government imposes strict regulations on the shipping of solvents.
   4. Paperboard and wooden cartons can be used for packaging most hot melts.
E. Does not necessitate continuous addition of thinners in glue pots and lacquer pans.
   1. Mixing requires time and labor when thinning is required.
F. Elimination of precipitation and settling encountered in some solvent systems on storage.
G. Rapid setting of melt.
   1. Delamination often results before the last traces of solvent permeate the film.
   2. Blocking may be caused by solvent retention.

TABLE 3

VARIOUS SURFACES TO WHICH ADHESION IS COMMONLY SOUGHT

Papers	Plastic Films	Metal Foils	Miscellaneous
Kraft	Casein	Aluminum	Clay
Sulphite	Cellulose	Copper	Cloth
Glassine	Cellulose acetate	Lead	Cork
Rag	Cellulose acetate butyrate	Nickel	Glass
Asbestos	Cellulose acetate propionate	Tin	Leather
Parchment	Cellulose nitrate		Metals
	Cellulose nitrate acetate		Mica
	Ethyl cellulose		Porcelain
	Gelatin		Stone
	Methyl methacylate		Wax
	Nylon		Wood
	Polystyrene		
	Polyvinyl alcohol		
	Polyvinyl alcohol acetate		
	Polyvinyl butyral		
	Polyvinyl chloride		
	Polyvinyl chloride acetate		
	Polyvinylidene chloride		
	Polythene		
	Rubber		
	Rubber hydrochloride		

Laminating Solutions—
Pressure Sensitive Adhesives

This type of a laminant is applied from a solution to either one or both of the materials to be adhered and can be com-

(**) For an excellent discussion of laminating and coating equipment by Oscar De Sylva, refer to *Modern Packaging;* 17, 117, No. 12 (1944).

COST ANALYSIS IS SOMETHING ELSE AGAIN!

Old Timers had a way of analyzing samples of paper by sight, sound, touch, taste and smell. The looks of a sheet suggested its general contents; the sound of tearing it gave a reasonable idea of its strength; the finish was indicated by its feel. When a small wad was chewed in the mouth, the tongue and palate passed their verdict and the nose confirmed it.

From the thinnest tissue to the heaviest board there is a Hamilton Felt that will do your work better, faster and at lower cost.

Modern paper technology is not so simple as that. Quality, tonnage and costs can't be analyzed by the "chew and spit" method. These are determined largely by the speed and thoroughness with which excess water is removed before the sheets pass to the drier rolls. You need Hamilton Felts to do this. Equip your least efficient paper machine with a Hamilton Felt. Speed it up. Keep accurate record of the increased tonnage and the reduction of broke. Note how little time and steam are needed at the driers. Compare the uniform formation with that of the product of the same machine before you used a Hamilton Felt.

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TABLE 5

Composition	Type	Adhesion to: Plastic Films: Cellophane	Cellulose Acetate	Ethocel	Koroseal	Pliofilm	Polythene	Vinyl Films	Saran	Papers: Kraft	Sulphite	Glassine	Parchment	Rag	Misc.: Metal Foils	Cloth	Glass	Wood	Properties: Heat Sealability	Color	Water Resistance	Grease & Oil Resistance	Flexibility	Odor	Stability	Pressure Sensitivity
Vinyl acetate-pigment	Solvent-laminant	E	E	E	E	...	P	E	E	E	E	E	...	E	E	...	G	E	F	W	F	G	G	E	G	P
Butyral	Solvent-coating	E	F	E	P	...	...	P	F	E	E	E	...	E	G	...	F	...	E	T	G	G	G	E	E	N
Vinyl acetate	Solvent-coat.-lam.	E	E	E	F	...	P	E	E	E	E	G	...	...	G	...	P	...	G	T	G	...	G	E	N	N
Rubber	Solvent-laminant	E	G	E	P	...	P	G	G	E	E	E	...	E	E	...	G	G	N	T	G	P	E	E	G	G
Polyterpene	Solvent-laminant	G	G	G	G	...	...	E	G	E	E	E	...	E	...	...	E	...	P	T	G	P	G	E	G	E
Modified phenolic	Solvent-laminant	E	E	G	P	...	P	E	E	E	E	E	...	E	F	G	F	E	G	T	...	...	G	G	G	N
Rubber-oil polymer	Solvent-laminant	...	...	...	...	E	...	E	E	E	E	E	G	E	E	...	...	...	N	AT	G	F	G	E	F	G
Rubber-oil polymer-wax	Solvent-laminant	...	...	...	...	G	...	G	G	G	G	G	G	...	G	...	...	...	N	A	E	G	F	G	F	G
Rubber-oil polymer	Solvent-laminant	E	E	...	F	G	G	G	E	E	E	E	G	E	E	...	E	...	N	AT	G	G	E	G	F	G
Rubber-rosin wax	Solvent-laminant	E	E	E	G	E	...	G	E	E	E	E	G	E	E	...	G	...	N	...	E	P	G	E	G	G
Rubber-rosin	Solvent-laminant	E	E	E	...	E	...	...	E	E	E	E	E	E	E	...	...	...	N	T	G	P	E	E	G	E
Vinyl copolymer	Solvent-laminant	E	E	...	E	...	F	...	...	E	E	E	E	E	E	...	G	F	N	T	G	G	E	E	F	E
Vinyl copolymer (modified)	Solvent-coat.-lam.	G	F	F	E	...	P	E	...	E	E	G	...	...	F	...	F	G	G	T	G	G	E	G	E	N
Vinyl copolymer (modified)	Solvent-coat.-lam.	...	P	P	G	...	P	E	...	E	E	F	...	...	E	...	E	...	G	T	G	G	E	G	E	N
Vinyl acetate	Solvent-coat.-lam.	E	E	F	P	...	P	...	...	E	E	F	...	E	...	...	...	...	G	T	G	G	E	G	E	N
Vinyl copolymer	Solvent-coat.-lam.	P	G	F	F	...	...	E	G	E	E	F	...	...	...	...	P	...	G	T	C	G	E	C	E	N
Vinyl acetal	Solvent-coat.-lam.	...	G	E	P	...	P	...	...	E	E	...	...	...	E	...	E	F	G	C	B	F	G	G	E	G	N
Rubber-wax	Solvent-laminant	G	G	G	F	G	G	G	G	G	G	G	G	G	G	G	G	...	P	C	B	E	E	G	E	...	E
Rubber-wax-asphalt	Hot melt-coat.-lam.	...	...	...	...	...	...	...	...	E	E	E	...	E	E	E	...	E	G	B	A	E	P	G	G	G	N
Rubber-wax	Hot melt-coat.-lam.	E	...	...	...	...	...	...	...	E	E	E	...	E	E	E	E	E	E	A	E	E	P	G	G	G	F
Polyamide	Hot melt-coat.-lam.	E	G	...	P	...	...	P	...	E	E	E	...	E	E	E	P	E	E	AT	G	E	P	G	E	G	N
Vinyl acetate	Hot melt-coat.-lam.	...	...	...	...	...	...	...	...	E	E	E	...	E	G	...	P	G	G	T	G	G	G	G	E	G	N

Key: E—Excellent. G—Good. F—Fair. P—Poor. N—None. T—Transparent. C—Cloudy. A—Amber. W—White.

pletely dried before combining. The lamination can then be accomplished by use of: (1) pressure (2) heat, or (3) heat and pressure, depending upon the properties of the adhesive. This type of adhesive generally possesses good low temperature adhesion and flexibility, and if delamination should occur the surfaces can be recombined by simply pressing them together. Also, it is usually possible to incorporate a larger amount of waxy materials into the composite, thus imparting better water vapor impermeability. On the other hand, cold flow is more apt to be encountered, resistance to delamination at higher temperatures is usually less and bond strength at room temperature is decreased. Whereas, delamination of pressure sensitive adhesives may take place with extremely small loads when the pull is steady, a considerably larger load is often required to tear apart the bond when applied suddenly.

Solvent Active Adhesives

These adhesives rely upon the retention of just enough solvents to remain tacky so that lamination may be accomplished with a minimum of pressure. On aging, the solvent is dispersed through the surface plies, enabling them to adhere to a more rigid intermediate. Lamination of metal foils to non-porous materials would not be plausible by this method since solvent release would be extremely poor and it may require months of aging before the bonded material would show its true characteristics. Formulations of this type must necessarily possess better compatibility with the surface to which it is applied as the final adherence can not be gained through tackiness as in the pressure sensitive laminants. There is then a certain correlation between compatibility and adhesion which can be seen by a study of Table 5.

Fusion Type Adhesives

Bond strength here depends upon a welding or fusing of two or more mate-

TABLE 6—Lamination

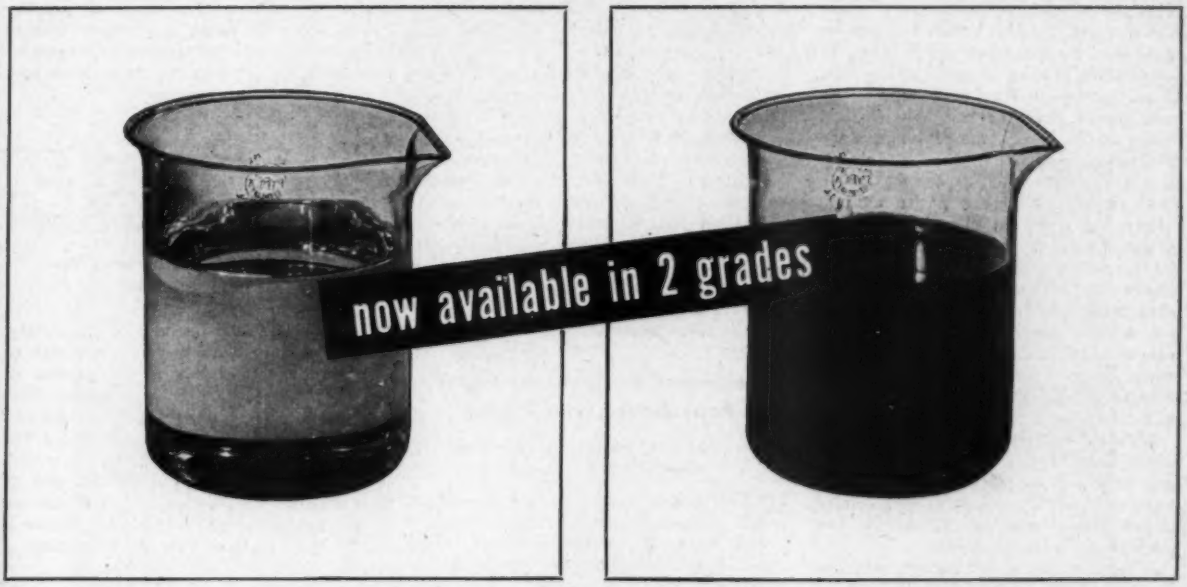
I. *Lamination of Plastic Films:*
- A. Lamination of two or more plastic films of identical composition by use of a fusion agent.
  - 1. Without the incorporation of extra solids.
    - a. *Examples:*
      - 1. Rubber hydrochloride (pliofilm) to itself, using:
        - a. Active solvents, such as styrene, furfural, low molecular weight chlorinated hydrocarbons, cyclohexanone and other ketones, etc.
        - b. Active plasticizers, such as fenchone, certain Santicizers, and other higher molecular weight chlorinated plasticizers.
        - c. Active oils, such as No. 1-D heavy oil, Neville Oil, Notol, Nevinol, etc.
      - 2. Vinylidene chloride polymers (Saran) to itself, using ketone solvents.
      - 3. Vinyl films to themselves, using fusion solvents.
      - 4. Cellulose films to themselves, using fusion solvents.
  - 2. With the incorporation of resins, rubbers, metals, and/or waxes.
    - a. *Examples:*
      - 1. Isomerized rubber hydrochloride, cyclized rubber, chlorinated rubber, natural rubber, etc., plus fusion agent in solvent (active or nonactive).
      - 2. Natural or synthetic resins plus plasticizer, plus fusion agent, plus solvent.
      - 3. Flaked aluminum or other metals plus plastic filler, plus fusion agent, plus solvent.
      - 4. Crystalline or microcrystalline waxes.
        - a. With plastic filler, plasticizer, and solvent.
        - b. Without plastic filler.
      - 5. Combinations of resins, rubbers, metals, and waxes, plus fusion agent, plasticizer, and solvent.
- B. Lamination of two or more plastic films of varied compositions together by use of a fusion agent.
  - 1. Without the incorporation of extra solids:
    - a. By use of a common fusion agent.
      - 1. *Example:*
        Saran to pliofilm with cyclohexanone.
    - b. By use of mixed fusion agents.
      - 1. *Example:*
        Kraft paper to pliofilm with quaternary ammonium compounds and carbon tetrachloride.
  - 2. With incorporation of resins, rubbers, metals, and/or waxes.

II. *Lamination of Metal Foils:*
- A. Foils to plastic films.
  - 1. Fusion of solids to film and adhesion of solids to foil.
- B. Foils to themselves with plastic binder.
- C. Foils to other foils with plastic binder.

III. *Theory:*
- A. Film solvency:
  - 1. Dispersion of solvent into solid.
  - 2. Dispersion of solid into solid through means of a common solvent (fusion agent).
- B. Degree of fusion:
  - 1. Application of heat.
    - a. Effect on rate of fusion (increase).
    - b. Effect on evaporation rate of solvent and/or fusion agent (increase).
    - c. Effect on properties of film and filler.
  - 2. Time element.
  - 3. Type of fusion agent used.
  - 4. Type of film used.
- C. Relation of molecular structure to fusion.
- D. Inclusion of nonfusible particles in filler.

IV. *Applicational Improvements Over Pressure Sensitive Laminations:*
- A. Increases waterproofness and water vaporproofness in lamination without reducing adhesion.
- B. Increases ply strength of films.
- C. Minimizes delamination on low temperature flexing.

ORTHO-NITRODIPHENYL VERSATILE PLASTICIZER



Monsanto Ortho-Nitrodiphenyl now is available in two grades—technical and refined. Both are excellent plasticizers with a wide range of uses. One is just as effective as the other, but the refined grade is preferable where color is important in the finished product. The technical grade costs only 6 cents a pound in carlots. The refined grade is 10 cents a pound in carlots. Both prices are f.o.b. St. Louis.

As a plasticizer, ortho-nitrodiphenyl can be used alone or in conjunction with other plasticizers. It is applicable to the entire range of synthetic resins from the cellulose esters and ethers through the vinyls and vinyl copolymers. It is compatible with alkyds and some synthetic rubbers.

Complete data and samples will be sent promptly upon request. You may use the convenient coupon below, contact the nearest Monsanto office or write: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri. District Offices: New York, Chicago, Boston, Detroit, Charlotte, Birmingham, Los Angeles, San Francisco, Seattle, Montreal, Toronto.

CHEMICAL AND PHYSICAL PROPERTIES OF MONSANTO ORTHO-NITRODIPHENYL

The figures included are approximately correct and can be considered as average values for regular production of ortho-nitrodiphenyl, Technical.

MELTING POINT	35°C.
BOILING POINT AT 10 MM.	172°C.
BOILING POINT AT 760 MM.	320–330°C.
REFRACTIVE INDEX AT 25°C.	1.6128
SPECIFIC GRAVITY AT 40°/15.5°C.	1.189
SPECIFIC GRAVITY TEMPERATURE COEFFICIENT	0.00083/°C. (33°–80°C.)
VISCOSITY AT 25°C. AT 45°C.	38 Centipoises 12 Centipoises
FLASH POINT	143°C. (289.5°F.)
FLASH POINT	179°C. (354.5°F.)

SOLUBILITY: Ortho-nitrodiphenyl is readily soluble in most organic solvents but is practically insoluble in water, either hot or cold. Some of the materials in which ortho-nitrodiphenyl will dissolve are:

Benzene	Ethyl Acetate	Mineral Spirits
Ethyl Alcohol	Amyl Acetate	Pine Oil
Methyl Alcohol	Ortho-Dichlorobenzene	Turpentine
Ether	Carbon Tetrachloride	Linseed Oil
Acetone	Perchlorethylene	Soyabean Oil
Methyl Ethyl Ketone	Glacial Acetic Acid	Corn Oil

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Please send, without cost or obligation, sample of Monsanto Ortho-Nitrodiphenyl and data on its use as a plasticizer.

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rials together. This type of lamination gives a far better bond strength than the two previously mentioned types of laminating adhesives. The fusing action may be brought about through the medium of either the solvent, the plasticizer, or both. The sensitivity of this action can well be exemplified by the following problem: In heat sealing Pliofilm to itself, it has been found that the air-dried surface heat seals more readily than the belt-dried surface. It can readily be determined which is the air-dried surface, by applying a drop of an active solvent, such as cyclohexanone, on the Pliofilm, folding it so that the two surfaces are separated only by a thin film of the liquid and then placing the material in an oven at 110 Fahr. for three minutes. A fusion of the two surfaces takes place only when the fusing agent was applied between the air-dried surfaces of the Pliofilm. With higher temperatures, longer periods of heating or stronger fusing agents, fusion may occur on both surfaces.

Waxes, flaked metals, or any other nonfusible material may be included between laminated webs as long as a fusible resin is present in large enough proportions to establish a link for welding the two outer plastic webs together.

A typical fusion lamination, such as shown in Figure 2, might be made between Pliofilm and chlorinated rubber. A nonfusible wax dispersed in the chlorinated rubber would, of course, weaken the bond. This type of lamination is very difficult to tear apart, its bond strength being nearly equal to that of the film itself. Fusion type laminations offer possibilities far beyond those obtained in the two previously mentioned methods; however, a detailed discussion is beyond the scope of this paper. The outline presented in Table 6 shows some of the work which has been done.

Applicability of Resin Composites to Base Surfaces

Adherence is most easily gained through mutual compatibility, e. g., in coating a porcelain object adherence would most likely be obtained through siliceous materials. Likewise, adhesion can be attained to Bakelite with phenolics, to Vinylite with vinyl polymers, to cellulose type films with homologous cellulose adhesives, or printing inks may be made to adhere to plastic films by incorporation of a resin, similar to the film composition in the ink base. Proper plasticization or the correct solvent scheme may also be important in the bonding together of similar materials.

In conclusion, the author should like to point out a few relationships which should prove helpful to both the formulator and the converter.

Water vapor impermeability may be attained by using waxy type adhesives and coatings, by laminating metal foils to the water sensitive surface or by using a waxlaminant in conjunction with such films as Saran or Polythene. Flexibility with a minimum of plasticizer is most prevalent in rubber type formulations. Grease- and oilproofness may be increased by using water- and alcohol-soluble composites in conjunction with such films as vinyl copolymers, methyl cellulose, polyvinyl alcohol, and polyamides.

Equipment for Treating Paper Or Paperboard with Resins

FRANK W. EGAN, Vice President
John Waldron Corporation

The treatment of paper or paperboard with phenolic, urea, silicone, acrylic, or other resins can be accomplished by using one of the following methods: (1) Dip and flow, (2) absorption, (3) pressure impregnation, (4) saturation, and (5) heat.

The dip and flow method shown in Figure 1 is a simple but costly operation. An excess of solvent is required to act as a wetting agent to carry the resin in and around the fibers of the web. The large quantity of solvent that is used produces a flow-back that helps to distribute the resin. The web of paper is dipped into the pan of resin around an immersion roll and is then carried up into a vertical or horizontal drying tower.

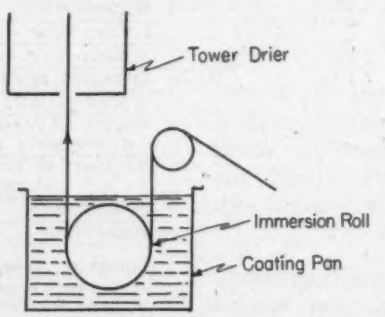

Fig. 1—Drip and flow treater

If the web varies in caliper or porosity and the resin varies in viscosity because of an improper preparation or degree of temperature, so does the treated web vary in degree of impregnation.

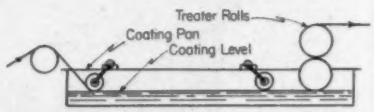

Fig. 2—Absorption treater. Pan flotation method

There are two methods of absorption, one of which is to carry the dry web of paper on the surface of the coating or resin in the pan and imbibe the resin (Figure 2). The resin will drive out most of the air as the absorption takes place. The same results can be accomplished in a more practical manner by passing the web of paper over the surface of a roll running in a pan of the resin as shown in Figure 3. The roll can be run in either direction.

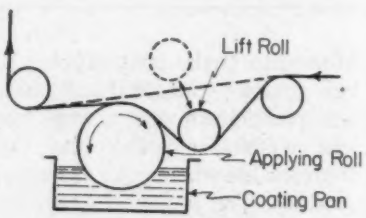

Fig. 3—Absorption treater. Roll and pan method

The roll method is desirable for webs having little wet strength and which absorb readily. The pan or bath surface method is best for stocks that need a longer time cycle, in which case a long saturating pan is used.

To impregnate or treat by the pressure method, an immersion roll and dip pan are used in conjunction with a pair of squeeze rolls (Figure 4). The web is merely dipped into the resin solution or coating and then carried through the nip of the

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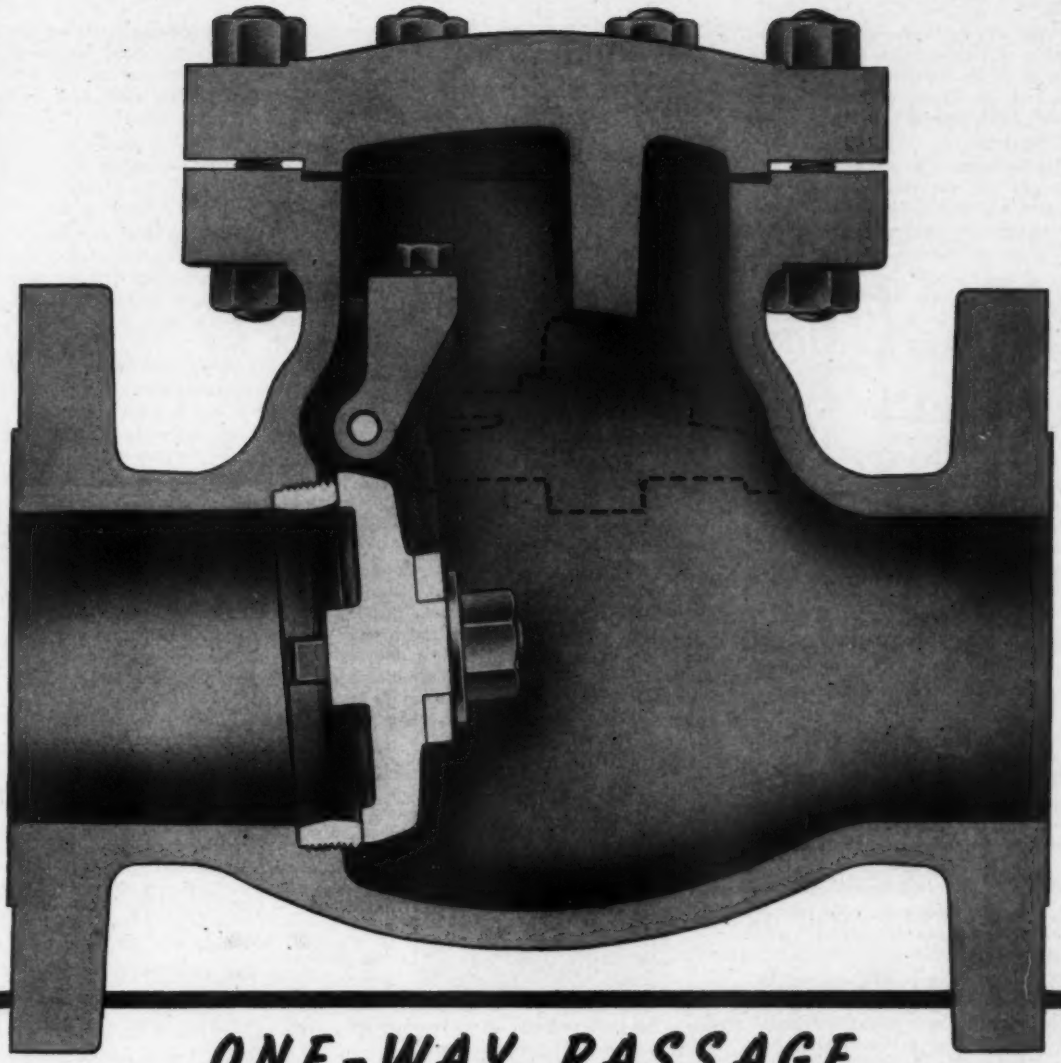

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squeeze rolls. The squeeze rolls determine the amount of impregnation by the pressure that is set by the clearance between the rolls and its relation with the caliper of the web. The treated web is then run through the dryer.

The second method of absorption is to wind into a roll the treated web after the web has been immersed in the resinous coating and passed through the squeeze rolls. The roll is allowed to stand for a given length of time to permit the resin to impregnate all of the sheet uniformly and then the web is passed through a dryer.

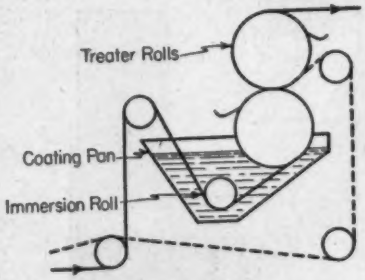

Fig. 4—Pressure treater. Pressure impregnation method

By saturation is meant the soaking of the web in a multigate saturator of the deep dip type with sky breathing rolls to release the air from the voids in the web or from the fibers. This method requires an excess of solvent to obtain a thorough impregnation but the amount of solvent required is not as great as that needed for the dip and flow method since the web is carried through a pair of squeeze rolls (see Figure 5).

Webs of paper can be impregnated by heat if the resin is melted by placing the resin powder on the surface of the paper as the paper passes over a heated arch and then through heated squeeze rolls as shown in Figure 6.

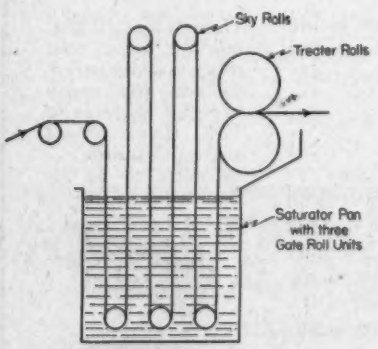

Fig. 5.—Multigate deep dip treater. Saturator method

Of the six methods described, the one that is used to the greatest degree is the pressure impregnation method for it produces an impregnated web with a fine degree of uniformity. The operation is a simple one and is easily controlled.

The equipment consists of the following units: Double unroll stand, swing roll tension, treater, dryer, cooling unit, guide, pull roll unit, double drum winder or a double center winder, and the drive. Their relative positions are indicated in Figure 7.

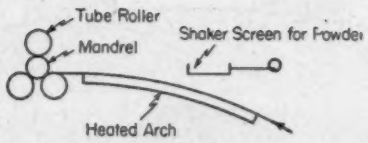

Fig. 6—Dry powder treater. Heat method

An immersion roll mounted on a rack and pinion device carries the web of paper or cloth down into the pan of resin and the web becomes coated and then contacts the face of the lower roll. The web passes around the lower roll and through the nip of the treater rolls; the pressure generated at the nip of the rolls presses the resin through the web filling the interstices. The treated web then passes to the dryer.

The treater is arranged so that one-side coating can also be applied. This is accomplished by passing the web beneath the large coating pan and through the nip of the coating rolls. The coating is applied to the face of the web by means of the lower roll partly immersed in a smaller coating pan placed inside the larger coating pan. The resultant coating is far from uniform as the coating will vary as the web varies in caliper.

To apply a uniform coating, a reverse roll coater as shown in Figure 9 is used. The coater consists of three rolls, all rotating in the same direction. The coating is applied by means of a casting roll running in the opposite direction of the web. The backing roll is composition covered and it presses the web against the face of the casting roll. A doctor roll placed above the casting roll, meters the coating to an accuracy that is permitted by the careful grinding of the casting and doctor rolls to 1- or 2- ten-thousandths of an inch.

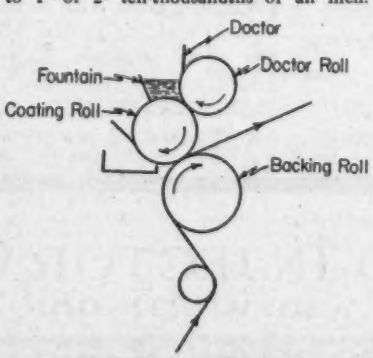

Fig. 9—Reverse roll coater

The resin is fed to the nip of the doctor and casting rolls. Side dams and a back dam form a fountain for the resin. Flexible cleaning doctors are used on the doctor and casting rolls.

The coating applied by the reverse roll coater is uniform within the tolerance of the accuracy of the ground rolls and is unaffected by the caliper of the web.

The dryer can be of any practical length that suits the required speed. The normal length is 75 feet for a speed range of 12 to 120 feet per minute depending on the caliper of the web or the weight of the cloth.

The treated web is carried through the dryer on a slat conveyor if the treated web is heavy and lacks wet strength. If the treated web has wet strength and is light, it is carried over an air floater.

The dryer is separated into a wet and dry zone. Each zone has individual supply fans, air heaters or steam, oil, or gas and a complete set of supply and recirculation air ducts. Only the wet zone has an exhaust fan and duct system.

Heated air at a controlled and recorded temperature is applied to both sides of the web by means of specially designed slotted ducts that produce a uniformly dried web. Air seals at each end of the dryer prevent leakage or solvent vapors into the room and they also supply a part of the makeup air.

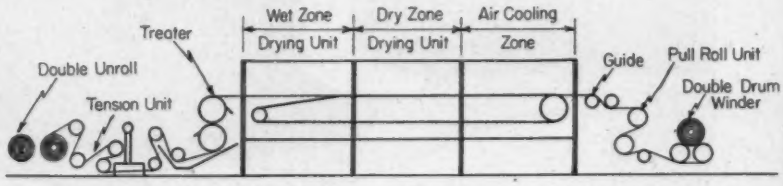

Fig. 7—Treater

If the air drying system is properly designed for a given production rate, there are no hazards when using solvents that are highly volatile.

To cool the web or bring it to room temperature, a cooling zone is added to the dry end of the dryer. The slat conveyor in the dryer is carried on through the cooling zone.

Air that is cooled by passing it around water coils is brought into contact with both sides of the web by slotted air ducts of the same design as the dryer units. A supply fan and duct system with controls, maintain the proper condition for cooling. A metal housing confines the cooling air of which a certain amount is taken into the dryer.

The drive must be such that the tension on the web as it passes through the dryer be under control and follows for shrinkage. This can be accomplished by means of a variable speed unit interlocked between the treater and the pull roll unit.

To vary the over-all speed of the complete treater unit a second variable speed drive is used which must be of a positive nature that gives a uniform rate of speed to the web.

THE DEGASIFICATION OF WATER

SINCE 1885 Cochrane engineers primarily have designed and applied equipment for the heating, degasification, and chemical treatment of boiler feed water. Naturally, in more than fifty years of such activity, problems were encountered requiring equipment to condition and degasify waters of unusual physical and chemical characteristics. For example, feed water deaerating equipment to operate at pressures ranging from sub atmospheric to over 125 lbs. per sq. in. has been designed and installed. Equipment for deaerating cold water at temperatures as low as 35 deg. F., and other equipment for removing carbon dioxide, hydrogen sulphide and ammonia have been furnished in large as well as in relatively small capacities.

The problem of removing dissolved gases from water may be quite complex, as coordinating a design and determining a guaranteed performance involves a thorough analysis of temperatures, gas pressures, viscosities, ionization, division of water and vent rates. An apparatus designed to remove oxygen to "zero content" is quite inadequate for removing a small quantity of ammonia. Likewise, a decarbonator designed to remove large quantities of carbon dioxide may not be suited to remove hydrogen sulphide.

Knowledge of these factors and their relative importance in the design of degasification apparatus is a part of Cochrane experience and is supported

[1

Page shown above is from "The Degasification of Water" Publication 4076.

HOW TO DEGASIFY WATER BY REMOVING

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Manufacturers interested in the problem of water degasification will be interested in Cochrane Publication No. 4076 which briefly indicates some of the problems and the solution offered by degasification equipment engineered and built by Cochrane. The broad coverage of Cochrane experience is indicated by the fact that equipment built for this purpose by Cochrane varies in size from 1000 lbs. per hour capacity to 45,000,000 lbs. per hour. Tests and data from actual installations place us in a position to quote on practically any requirements. Write for a copy of the publication shown above, or ask about specific details.

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Bleaching Process and Equipment

E. VIGGO ULLMANN
Mechanical Engineer

The Kamyr bleaching system was first developed at one of Scandinavia's greatest sulphite mills to bleach stock to a high grade alpha pulp to be used for rayon.

The system for sulphite rayon pulp consists simply of three to four towers, arranged in series, in which is carried out: chlorination, neutralization, washing (or diffusion), and in certain cases acid treatment.

The bottom of a tower is shown in Figure 1 and the design of this bottom part is most important in the planning of a modern bleach plant. It can be seen how the circulating pump is placed so as to receive all the pulp in the bottom of the tower and to bring it into a rotating movement around the guide vane dividing the bottom part in two. As new stock enters into the tower near the suction part of the impeller, the stock in the tower is forced upwards and eventually overflows over the top. The capacity of the pump is designed in relation to the incoming stock so that it will handle about six to eight times the raw stock which obviously makes every fiber pass through the pump six to eight times before it eventually starts on its upwards journey through the tower. The chemicals (chlorine, NaOH, or acid) are added just prior to the pulp's entrance into the pump, and a thoroughly complete mixing thus is insured.

Naturally the number of stages, as well as the sequence in such a system may be varied in many ways to conform to the special desires of the individual plant. The design of the tower will always remain the most important detail as an intimate mixing and even distribution of chemicals and fibers will always be most imperative.

The final stage of hypochlorite treatment may take place in batch bleachers in the ordinary way, or if a continuous system is desired, another tower is added to the ones already mentioned.

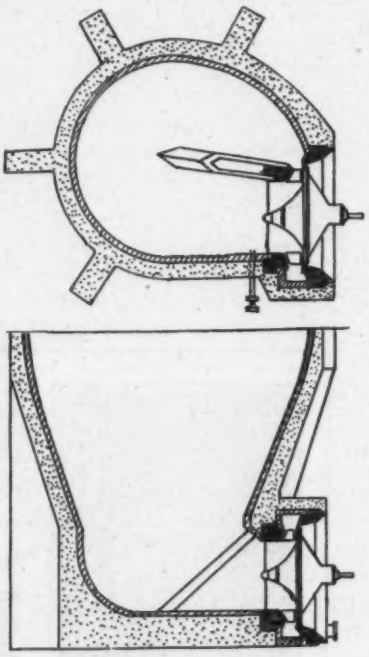


Fig. 1—Details of tower bottom

The consistency of the stock in the various stages naturally may be varied to suit local requirements, but most often the consistencies and temperatures, as well as calculated reaction time, are as follows: (1) chlorination, 3%, 60 Fahr., 30 minutes; (2) neutralization, 6%, 200 Fahr., 250 minutes; (3) diffusion 3%, 60 to 80 Fahr., 25 minutes; and (4) hypochlorite 6 to 8%, 95 Fahr., 3 to 6 hours.

Between each stage of the bleaching system, the stock is washed on a filter, normally of the pressure type. It may be equipped with a shredder to break the pulpweb going off the pressure roll. The pressure between the perforated, wireclad drum and the rubberlined pressure roll is maintained by means of counterweights whereby the load and consequently the dryness can be controlled. The inlet density of the stock may vary on these filters between 0.5 to 3% (moisture-free), and the ultimate dryness is between 12 and 14% depending upon initial consistency, kind of pulp, etc. In the bottom of the vat is arranged a special washwater pipe which adds to the washing effect of the filter, and though the eventual dryness is less than on a suction filter, about 25% more water is used on a pressure filter than on a suction filter. There is a better wash of the fibers. The water is added at the right moment, that is when the web that has just started to be formed on the drum has reached a dryness of 4 to 5%, and dilutes it again to 1 to 2%. Both theoretically and in practice, such double washing is the most efficient.

The capacity of the pressure filter naturally is dependent on the type of fiber, and other local conditions, but roughly one may calculate with about 1 ton per inch working width, an ultimate dryness of 14% or more.

For higher capacities, a special filter has been developed on the same principle, known as the "duplex" filter (Figure 2). The pulp inlet is at A and the two filter drums are pressed together in the same way as the pressure roll and the drum on the ordinary "simplex" filter. Webs are formed on both drums; the two webs are pressed together at B whereafter the stock follows the largest drum in its rotation towards the picking-up roll C whence it is removed by a scraper. The wash-water pipe is shown as D and the wash-water is distributed along the whole width of the filter in the same way as on the simplex type. The white water leaves on both ends, and no pumps are necessary for the removal.

Still another type of filter is the so-called "rotor" filter. This filter, in reality, is a combination of a pressure and suction filter, the inner drum being equipped with suction chambers, and the outer drum being pressed against the inner drum to obtain the squeezing action after the washing. The stock enters and leaves the filter along the same centerline parallel to the axis of the filter drums, and the outer drum is pressed against the inner by means of rollers, hydraulically operated.

Modern bleaching plants demand a higher consistency than was the case only a few years ago, and in such cases, a tower is recommended in which the stock enters at the top and slowly sinks down without any circulation. Near the bottom, the stock is diluted to a consistency that can be handled by the circulation pump which is arranged in much the same way as in an upwards working tower, and eventually is carried away by a transport pump of the built-in type. The dilution is made with

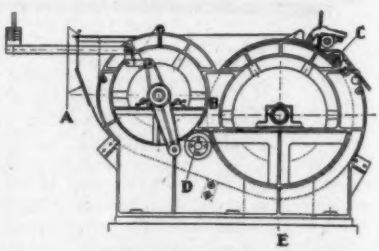
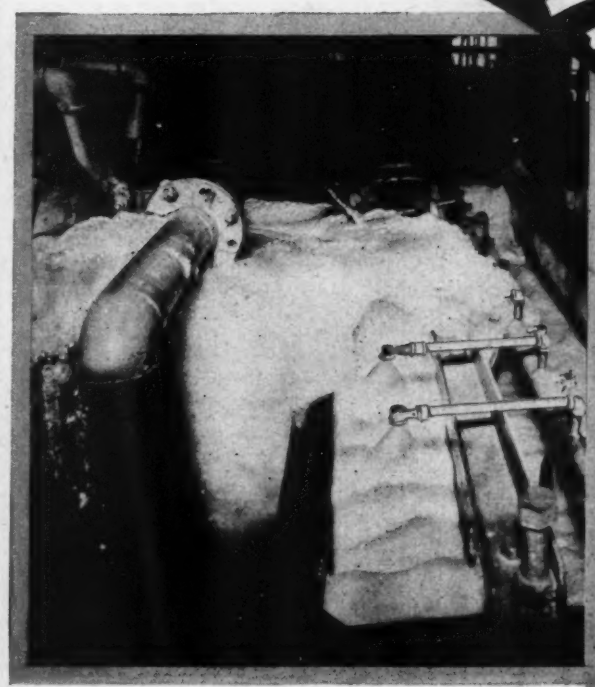


Fig. 2—Duplex filter

water or with chemicals depending upon what treatment the stock is subjected to in the following stage.

Still another high-density system has been developed in Sweden during the last years. The towers of this system are equipped with a screw in the bottom which presses the stock upwards while it simultaneously concentrates the stock to 15 to 16%. The liquor thus squeezed out of the pulp is used again or recovered.

NOPCO-KF did THIS in 5 minutes!



Head-box in leading paper mill, showing obstinate foam condition.

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Many experts still prefer batch bleaching, and special batch bleacher can be used instead of towers where desired.

The newest in bleaching development is the sodium peroxide bleaching of groundwood. A system for use with this method of bleaching has been designed, and has previously been described in detail by the author (Ullmann, E. V., *Paper Trade J.* 118, No. 25: 35-38, June 22, 1944).

The main demands from a modern bleaching plant can be stated as follows: (1) Quick mixing of stock and chemicals, (2) even distribution of the chemicals through the whole stock, (3) ample time for reaction, (4) thorough washing between the stages, and (5) a certain flexibility of the design, so as to allow minor alterations in the density, the time, temperature, etc.

Newer Starches for Paper Coating

C. C. KESLER[1] and E. T. HJEMSTAD[2]

Unmodified corn starch as commercially produced is practically insoluble in cold water and if heated, these granules swell and get thick, forming a paste. Obviously, this material does not lend itself as such to do an adhesive job for coatings because of this and other reasons which will be discussed subsequently, and it has too great a consistency even in quite low concentrations. This consistency must be modified or reduced to the point where the ratio of adhesive to clay is sufficiently low to give a good working viscosity and still retain a strong bond. There are, of course, a number of ways that the consistency can be reduced but all of them are not equally good in terms of the physical properties needed for machine coating. To mention a few methods which are more or less common knowledge, there are wet acid modification, enzyme modification, oxidation, and torrification modification. The question naturally arises why one method should be chosen in preference to another. This requires some thought as to what starch is as it is separated commercially from the other components of corn. It has been shown that rather completely dispersed corn starch in water can be fractionated by the addition of hydrophobic groups to one fraction, making it insoluble, while the other fraction remains dispersed (Schock, T. J., *J. Am. Chem. Soc.* 64: 2957, 1942); (Pavsu, E., and Mullen, J. W., *J. Am. Chem. Soc.* 63: 1168, 1941); (Caldwell, C. G., and Hixon, R. M., *J. Am. Chem. Soc.* 63: 2876, 1941). The fractions when separated and studied have different physical and colloidal properties. It is generally believed that the principal fraction is composed of large branched polymers with a smaller fraction composed principally of smaller straight-chain polymers (Kerr, R. W., Trubell, O. R. and Severson, G. M., *Cereal Chem.* 19: 64-81, 1942); (Bates, F. L., French, D., and Rundle, R. E., *J. Am. Chem. Soc.* 65: 142, 1943). These latter are responsible for the gelling of starch and for its retrogradation and, in some cases, contribute to the difference between starches of different origin. It should be remembered, however, that starch as hydrated in most commercial uses has not been torn apart to any appreciable degree (Kesler, C. C., and Black, W. C., *Paper Trade J.* 114; No. 21, 57-60, 1943). Commercially prepared starches, while not dispersed to the degree that will allow complete fractionation, still possess many properties of the fractionated starch unless some treatment is given to modify them. It is here that the different modification methods are employed. The orthodox or commonly used methods previously mentioned serve to meet many of the needs of coating but as all technical men are aware, the perfect material has yet to be made. New uses and new materials often require a new approach.

(1) Director of Research, Penick & Ford, Ltd., Inc.; (2) Research Chemist, Penick & Ford, Ltd., Inc.

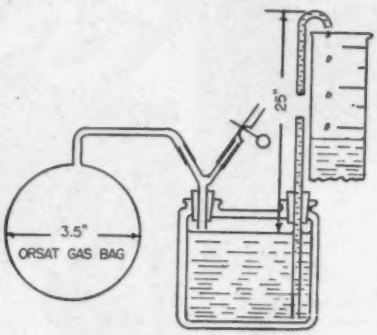

Fig. 1—Apparatus for measuring free shrinkage of films

In studies to produce improved starch adhesives for coatings, the following technique was developed, which is believed to be an improvement. A corn starch which has been modified to make it suitable for coating as measured by standard practice, is reacted with urea-formaldehyde reaction product by cooking the two together in an acid condition to a definite hydration temperature (Patent application made). The reaction between the starch and resin forming chemicals will be obvious by the excessive gelling that will be observed. However, if the temperature is maintained, a viscosity of the order of the original starch results. The physical properties are modified in various other ways. The tendency to gell has been inhibited, the cohesiveness has been increased, the free water has been decreased. The results are as if the linear polymers have been branched. The retrogradating fractions are dispersed to a degree that they can no longer be mutually attracted to each other and thereby become insoluble. It will be obvious to those skilled in the coating art that the attainment of the above changes should be quite desirable in allowing for the production of a desirable coating.

An exceptionally valuable property of this new starch-resin is the high degree of water resistance which may be developed. By proper control of pH, cooking temperature and time, drying temperature, and concentrations of resin, the amount of water resistance may be varied. Although coatings made with this starch-resin are highly water-resistant, they should not be confused with water-repellant coatings.

Water penetrates into the coating as readily as in standard starch-clay types. The particles of clay are, however, bound tothe paper firmly even though the coating is wet. Good penetration is necessary for best results in printing.

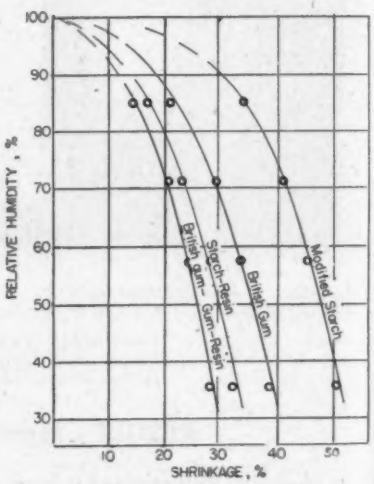

Fig. 2—Shrinkage of starch films at different humidities

In order to determine the effectiveness of the formulations, it was necessary to devise a simple and rapid method of evaluating comparative water resistance. Several standard methods were tried and the following method devised by the authors appears to give quite consistent results. A 50-watt, 100-volt light bulb is dipped in the coating mix, inverted and dried. When dry, the bulb is attached to a current outlet, and lit for a definite interval. The

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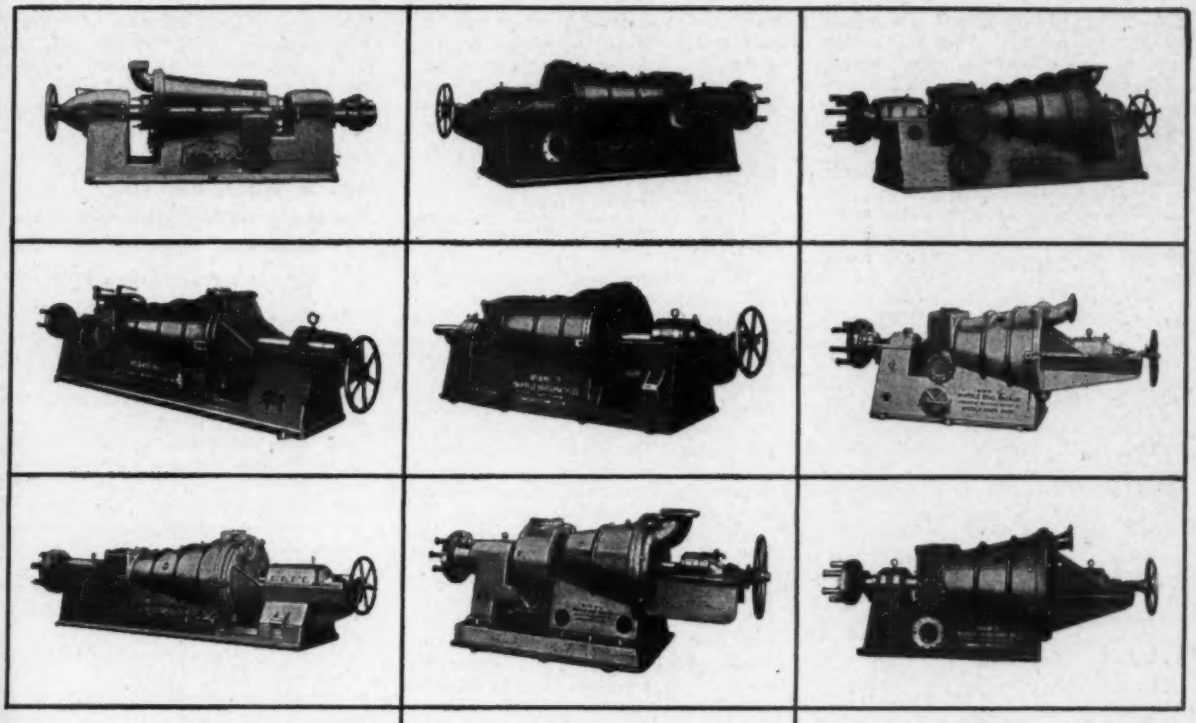

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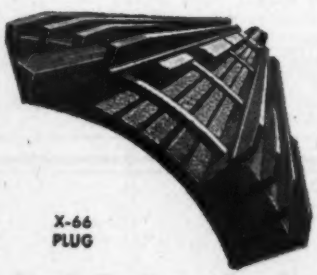

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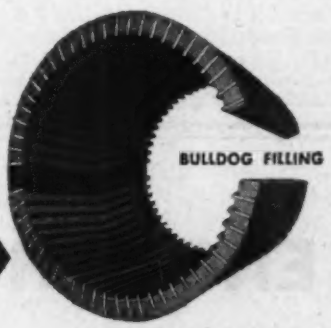

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coated, dried bulb will reach a maximum temperature of 125 C. The bulb is then attached to a variable speed electric motor by means of a Gooch crucible adaptor and rotated against a circular brush immersed in 300 ml. of clear, cold water for a definite interval. The turbidity of the water is measured in a nephelometer. The water resistance developed will vary inversely with the turbidity of the water. This method must, of course, be supplemented by additional tests on coated paper.

When a thin layer of cooked starch paste is spread on a surface and dried, a very noticeable shrinkage occurs. This shrinkage is apparently greater in starch than in many other organic film-forming materials. The dried films are very brittle and easily shatter when dried to low humidities. This would seem to indicate that there are internal strains in the film which may be caused by this shrinkage. From experience in other adhesives, it has been found that shrinkage of films and the resulting strains developed have a very significent effect on the bonding strength. It is believed that there may be a definite correlation between the shrinkage of starch films and other characteristics of the starch.

In order to determine the extent of shrinkage of starch films under varying conditions, a new technique was developed in which the drying starch film is allowed to shrink its maximum without encountering a great enough resistance to affect its shrinkage. Wrinkling of the film is also avoided.

An Orsat gas bag, 2 by 4 inches when deflated, is attached to a combination water reservoir and manometer as shown in Figure 1. Air is pumped in an air inlet at the top of the reservoir until a water column extends to the top of the manometer. The height of this water column will determine the extent to which the balloon is inflated. If the entire system is maintained at constant temperature and pressure, anything forcing a contraction of the balloon will cause water to be displaced from the reservoir through the top of the manometer, while the pressure inside the balloon will vary only slightly. If a film is cast on an expanded balloon and allowed to dry, this system will permit the film to shrink its maximum without encountering any appreciable resistance, while at the same time the rubber will contract to accommodate this shrinkage. The amount of shrinkage can be automatically recorded by catching the displaced water in a graduated cylinder, the number of cubic centimeters of water displaced being proportional to the decrease in area of the balloon, according to the relationship:

$$\log \Delta A = 0.6845 + 2/3 \log \Delta V$$

where ΔA = decrease in area of a sphere
ΔV = decrease in volume of a sphere

The procedure used for casting films and attaching the gas bag follows:

Procedure—The clean and dry balloon is attachced to the water reservoir and air pumped in the air-inlet until water extends to the top of the manometer. A pinch clamp is placed across the air inlet and across the rubber tubing leading to the balloon. The balloon is then removed and dipped into the solution containing the film forming material, allowed to drain, attached to the reservoir again, and the pinch clamp removed. The film is allowed to dry at a known, constant humidity and the amount of water displaced is measured when no further shrinkage occurs at that humidity. Constant temperature must be maintained throughout the whole operation. In making comparative studies, it is necessary to apply films of approximately the same weight. This can be accomplished by a quick weighing of the balloon and wet film immediately after dipping in the solution. Multiplying this weight by the percent concentration will give the approximate dry weight of film. Several starches and starch combinations were cooked and films case on the Orsat gas bags. These films were dried at various humidities.

The data show several signficant facts. First, that the amount of shrinkage of a film containing starch will depend on the moisture content of the film. Invariably a greatly increased shrinkage was obtained with lowered humidity. Second, it is possible to decrease the shrinkage of a starch film by reacting the starch with resins.

This lowered shrinkage may be the result of structural changes which are evidenced also by the loss of tendency to gel and retrograde. This, together with increased water resistance when desired, may be obtained by the use of starch-resins or an adhesive in paper coatings.

Experimental evidence indicates that starch films have a high tensile strength. If the tendency to develop internal strains and resultant brittleness at low humidities be eliminated the application and efficiency of starch sizings and coatings is materially increased.

Waste Water and Fiber Recovery with Reclaimers of the "Precipitator" Type

S. B. APPLEBAUM[1] and J. R. RHINEHART[2]

Waste waters in pulp and paper mills (particularly the white waters) have been treated for some time in "save-alls." These are devices that separate fiber from the white water either by: (a) screening; (b) settling, or (c) flotation.

In all of these devices, the separation of the fibrous solids from the water is accomplished mechanically either by catching the fiber on fine mesh wire screen or by using large tanks so that the velocity of flow is so small that the fibers settle by the force of gravity to the bottom, or by adding reagents which float the fibers to the top. Once the fiber is separated, it is withdrawn from the scene of action and no longer plays any part in the treatment of the waste water.

The Spaulding precipitator was first introduced into industry to raise the efficiency and completeness of the chemical reactions usually involved in the water treatment art, as well as to improve the separation of the precipitates from the treated water. The principle involved was to maintain a so-called "sludge blanket" or suspended sludge filter—consisting of the previously accumulated precipitates—in a tank by gentle agitation and to arrange intimate contact of the water and chemicals with this suspended sludge filter. Then the tank was so designed that the upward velocity of the rising water was gradually decreased so that finally the velocity was so low that the sludge or precipitates were left behind and a clear treated water emerged. The contact of the water with the suspended sludge filter was usually made to last for 15 to 30 minutes or longer. This long contact between the solid and solution phases brought about the desired saturation

(1) Vice President, (2) Field Test Engineer, the Permutit Company.

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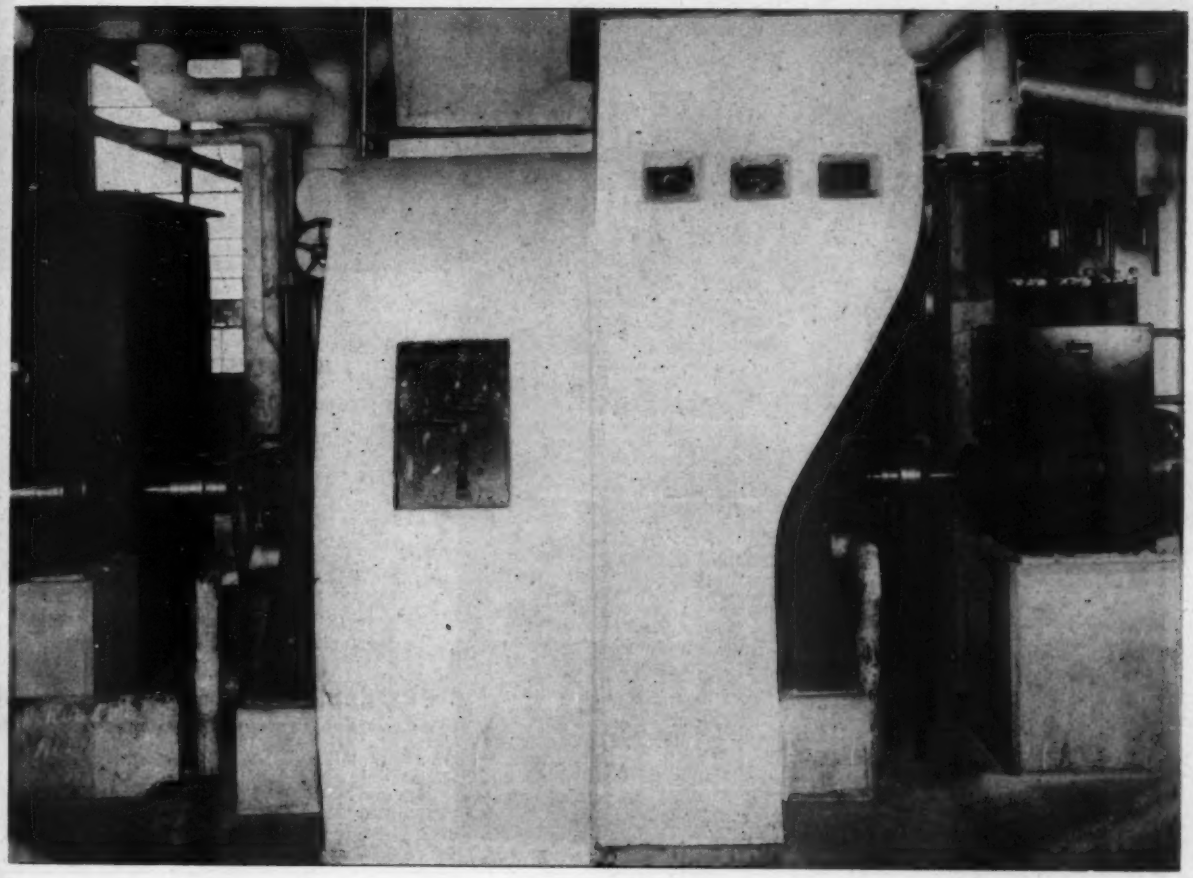

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equilibrium. Figure 1 shows a standard Spaulding precipitator.

During the last decade, the precipitator has come into extensive use for the following water treatment processes:

1. Water Softening: By cold lime (or lime soda) process and upward filtration through suspended sludge blanket consisting of precipitates produced by softening reactions.

2. Turbidity and Color Removal. By coagulation and upward filtration through suspended sludge blanket containing floc produced by coagulant.

3. Taste and Odor Removal: By upward filtration through suspended sludge blanket containing activated carbon.

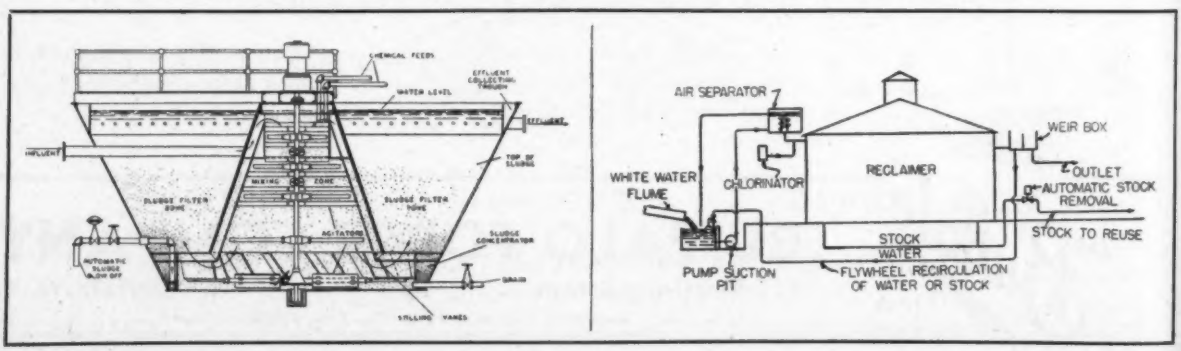
4. Silica Removal: By upward filtration through suspended sludge blanket containing magnesium hydroxide or oxide.

5. Fluoride Removal: By upward filtration through a suspended sludge blanket containing magnesium hydroxide or oxide.

It was quite natural, therefore, to investigate the value of a suspended sludge filter in connection with waste water treatment. All the previous white water "save-alls," as previously mentioned, disposed of the solids rapidly and did not accumulate them to aid in the treatment. It was suspected and did not intimate contact with previously accumulated fibrous solids might be helpful in waste water treatment also. But the very striking clarifying effect obtained thereby exceeded anticipation.

Several years ago a southern sulphite pulp mill using a well water supply found that the mill expansion called for additional water which it would be difficult and expensive to obtain from the ground water sources. Also the waste water discharged was causing undue pollution. About 6,000,000 gallons of waste water were available from unbleached stock processes, screens, rifflers, and deckers that might be treated and reused in certain processes of the treatment could be made efficient enough to remove over 85 per cent of the original fiber content. In this case there were about 200 to 300 rpm (1.66 to 2.5 pounds per thousand gallons) of fiber present in the waste water together with traces of starches, sugars, terpenes, resins, etc.

Fig. 1 (left) Spaulding precipitator. Fig. 2 (right)—Flow diagram of reclaimer for stock and water losses



Sandy Hill cylinder vat built of nickel-clad steel. Cylinder mold can be adjusted to suit stock flow requirements. An adjustable slice is provided, as well as a Bertrams flow distributor and an air pressure device for evacuating water. Photo courtesy of Sandy Hill Iron & Brass Works.

This cylinder vat circle is 11 feet long, yet was formed from a single nickel-clad steel plate. Although the nickel cladding amounts to only 10% of the ¼" plate thickness, it provides the full corrosion resistant, non-contaminating properties of solid nickel.

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Formed and welded from nickel-clad steel plate, the vat is 11' long, 8' wide and 4' deep. The vat circle was fabricated from a *single* nickel-clad plate 127½" wide and 127⅜" long. Many welding operations were thus eliminated.

Nickel-clad steel is generally suitable for all heavy equipment where the properties of pure nickel are desired. At the temperatures employed in the cladding process, nickel and steel tend to alloy at the plane of contact. The bond between the layer of nickel and the heavier layer of steel is, therefore, a permanent one.

Among the more important advantages offered by nickel-clad steel are these:

1. Its rustless surfaces provide the same corrosion resistance as pure nickel *at a substantial reduction in cost.*
2. High mechanical strength (55,000 psi minimum).
3. Availablity in extra large plate sizes (for example 13 x 25 feet in the case of ¼" plates). This permits fabrication with a minimum of welds.
4. Ordinary welding methods produce *continuous* corrosion resistant surfaces. No special treatment is required *after* welding.

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First, a pilot plant was built on the old-fashioned lines of adding a coagulant such as alum and then agitating and finally settling the floc in a horizontal flow settling chamber. This removed about 30 to 50 per cent of the solids present and required large doses of coagulant.

Then a small laboratory unit was constructed to demonstrate the effect of a suspended sludge filter. A carboy was inverted and the waste water was introduced at the bottom so as to create sufficient turbulence to suspend the fibrous solids. No coagulant was added. The effluent was withdrawn at the top. As the solids accumulated, the clarity of the effluent improved. When the test was first started, the solids removal was under 50 per cent. When the solids suspended occupied about two-thirds of the carboy, the solids removal exceeded 85 per cent. Apparently the contact with the suspended fibrous solids resulted in a self-coagulating effect, which, together with the actual mechanical straining by passage upwardly through the suspended solids, were responsible for the great improvement in the clarification accomplished.

Another similar test some time later at the Southland Paper Mills, Inc., at Lufkin, Texas, resulted in the installation of a Permutit "Reclaimer" for a capacity of 1180 g.p.m. or 1,700,000 gallons per day. The paper "Waste Water Utilization by Clarification" by C. C. Porter and C. Carpenter gives details of the results obtained from this installation.

Figure 2 shows a typical flow diagram. The waste water is collected in a suction well where it is roughly screened to remove to cull screen rejects, chips, and slivers. It is then pumped into an air separator where foam and air bubbles are released. The separator also acts as a head box since it overflows back to the suction well. This does away with troublesome level regulating valves. The water flows by gravity from the air separator to the reclaimer. Chlorine or other sterilizing agent may be added to the influent of the reclaimer to prevent slime growths. It saves an equivalent dose of chlorine that would be added usually in the process where the treated water is reused.

The reclaimer is usually supplied with an internal concentrator where a portion of the suspended fibrous solids settle out and concentrate and this concentrate is blown off automatically to be reused in certain processes, if desired. Thus the top of the suspended "blanket" is kept at the desired level.

Recirculation of a portion of the treated water and concentrated solids back to the influent may be found advantageous in certain cases to establish a flywheel effect. A fairly constant temperature range is desirable.

Usually no coagulant is required, therefore, the operating cost is negligible. The operation is simple and the maintenance of the suspended solids is accomplished by gentle agitation requiring very little power. The savings accomplished by the reuse of the treated water and reuse of the concentrated solids usually returns the investment in a short period.

Soluble Synthetic Salt Cake—
A Kraft Liquor Study

VERNON WOODSIDE, Tech. Rep.
Mathieson Alkali Works, Inc.

The use of synthetic salt cake for alkali makeup at the green liquor stage in kraft systems was recently described. (Woodside, Vernon, McMahon, J. D., and Vincent, G. P., *Paper Trade J.*, January 18, 1945), (Woodside and Vernon, *Paper Mill News*, December 16, 1944). As a result of a plant study, more detailed data are now available with regard to the effect this new procedure has on the composition of the liquor at various points of the system.

The study was carried out in a kraft mill equipped with a B & W Tomlinson oscillating spray furnace and several old fashioned rotary furnaces. The latter were used to burn that portion of the black liquor which could not be handled by the B & W furnace.

The first six days of the study period were used as a control period, plant operations being continued as usual. The customary practice, which was continued during this time, was to add about 60% of the by-product salt cake and sulphur to the rotary furnaces and the remainder of the salt cake to the B & W. No sulphur was added to the B & W.

This control period was followed by a 15-day test period, during which time the operation of the rotary furnaces continued unchanged,* but synthetic salt cake was dissolved directly into the dissolver tank of the B & W. This was accomplished by running an ordinary 4-inch iron pipe from the salt cake dry feeder to the dissolving tank thus bypassing both the black liquor mixing tank and the furnace.

In an effort to determine the maximum amount of synthetic salt cake which could be fed to the dissolver, the feeder was operated up to its full capacity of 80 pounds per minute or 57.6 tons per day for about 1 day. The synthetic salt cake went into solution with no difficulty. The entire daily salt cake requirements of the mill could have been added in this fashion had this been desired. For the remainder of the test, the salt cake was added at the usual rate of 40 to 50 pounds per minute.

A study of the analyses of smelt from the B & W during the control and test periods bears out the view held by many kraft mill operators that about half the sulphur is lost in the first pass through the furnace. Actually the analyses indicate that a makeup of about 42.2% on the basis of sodium sulphide or about 38.2% on the basis of total sulphur as sulphur, is necessary in this particular case to keep the sulphur in the smelt at a normal balance. This calculation of sulphur makeup is based on smelt analyzed as green liquor. It should not be confused with soda makeup since the total alkali is the same in both the control and test periods.

Addition of synthetic salt cake in the green liquor reduced the sulphate in the B & W smelt by about 31%. The reasons for this reduction in sulphate content are relatively clear. There are normally three ways in which sulphate may occur in the smelt: (1) From unreduced salt cake added directly to the furnace either as burden in the liquor system or as makeup chemical; (2) From reoxidation of sodium sulphide or other sulphur compounds already formed from the added salt cake or black liquor; (3) From oxidation of sulphur compounds returned with the black liquor.

The elimination of salt cake addition to

*Small amounts of synthetic salt cake were occasionally added to the rotary furnace during the test period because it was more readily available than byproduct salt cake. However, since the synthetic salt cake was smelted it would have no significant effects on the results of the test period operations in the amounts used.

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the unit, thereby eliminating about 37% of the sulphur, resulted in a 31% sulphate decrease (or only about 25% calculated as sulphur). There arises, therefore, some interesting speculation as to the source of the unreduced sulphate usually found in the liquor system, namely, to what extent is it due to the salt cake introduced into the furnace or to the reoxidation of the sodium sulphide formed from the organic sulphur compounds in the black liquor.

The sodium sulphide content of the green liquor during the test period was decreased by about one-fifth of its value during the control period, while the polysulphide sulphur was increased by nearly 2½ times. This was to be expected from the nature of the material added.

The thiosulphate content was increased by about 2⅓. The role of this chemical in pulping wood is not entirely clear at this point although it is hoped that data will be obtained to clarify this.

In the green liquor, the sulphate decreased by an average of about 13% instead of the 30% decrease found in the B & W smelt. Since the B & W contributes roughly about half the green liquor, this analysis corresponds to the data given earlier.

The change to synthetic salt cake in the B & W unit, which caused a 20% decrease in green liquor sulphide, results in only an 11.6% decrease in the white liquor sulphide. Apparently some change in the sulphur compounds occurs during the causticizing operation.

Since it is the white liquor composition which is of major interest, the only purpose of including green liquor data is to indicate the changes in the proportions of sulphur compounds occurring throughout the system.

It may be observed from the white liquor table (Table 3) that the total sulphur in grams per liter has increased by 23.3% upon the introduction of synthetic salt cake into the B & W dissolving tank. This may be accounted for, in part, by the fact that the amount of sulphur added per liter of white liquor produced was increased by 15.2%. Allowing for an experimental error of 5% in total quantities measured, there still remains nearly a 4% increase in total sulphur in the green liquor. It may be concluded that the sulphur losses have been reduced, either because the salt cake was no longer added directly to the furnace, or because this process results in less sulphur loss from the black liquor entering the furnace. It is obvious that there is almost a complete absence of furnace loss from the synthetic salt cake when it is added directly to the green liquor, but it is not certain whether this saving is sufficient to account for the entire difference observed.

Further examination of the data in Table 3 shows that the chief gains in sulphur were in the form of thiosulphate and polysulphide. Since the role of the thiosulphate is unknown at the present time, it may be considered a total loss for cooking although this is not a certainty. On the other hand, earlier data presented (Woodside, Vernon, McMahon, J. D., and Vincent, G. P., *Paper Trade J.*, January 18, 1943), as well as the behavior of the test cooking liquor, indicate that the polysulphide may be considered a total gain of sulphur for the cooking liquor. The total gain of sulphur in the form of monosulphide and polysulphide amounted to 4.90 grams per liter. Subtracting the increase in thiosulphate, there remains an increase of 2.31 grams per liter of sulphur. This represents an increase of 9.7% of active sulphur, calculating on the basis of total sulphur or a gain of 13.4% on the basis of polysulphide plus monosulphide sulphur.

It may also be noted that the unreduced sulphate content of the white liquor was reduced by 42.5%, raising the mill reduction test by 6.74 points.

Based on an acid titration, which includes only the monosulphide, the sulphidity as indicated by the mill test was decreased by 1.07. Considering both the monosulphide and the polysulphide as active, however, the sulphidity was increased by 8.32, or 34% over the normal. This explains the fact that the liquor acted like liquor of high sulphidity. It also indicates why cooking cycles are upset when elemental sulphur is added to the digester without being taken into account when the sulphidity is calculated.

A series of tests was undertaken to determine whether any greater corrosion difficulties would result from the introduction of synthetic salt cake as described. Fire box steel test pieces were bolted on the inside of four digesters. Approximately the same number of cooks were made during the control and test periods and the differences noted. On the basis of the tests, it may be concluded that no increase in corrosion is caused by the introduction of synthetic salt cake in the manner described.

Table 3—Composition of White Liquor and Sulphur Make-up to System Expressed as Grams per Liter

	Control Period Salt Cake Added to All Furn.	Test Period Synthetic Salt Cake Added to B & W Dissolving Tank	Grams Per Liter Plus or Minus Normal	% Plus or Minus Normal
Total alkali*—titration, ml.	22.01	21.01	...	.....
Sodium sulphide	37.46	33.56	...	— 11.6%
Sodium thiosulphate	4.82	11.20	...	+132.0%
Sodium sulphite	1.07	.47	...	— 56.0%
Sodium sulphate	18.95	10.89	...	— 42.5%
Sulphur in sulphide	15.40	13.76	—1.64	— 10.6%
Sulphur as polysulphide**	1.86	8.40	+6.54	+352.0%
Sulphur in thiosulphate	1.95	4.54	+2.59	.....
Sulphur in sulphite	0.27	0.11	—0.16	.....
Sulphur in sulphate	4.26	2.45	—1.81	.....
Total sulphur***	23.74	29.26	+5.52	+ 23.3%
Polysulphide sulphur plus monosulphide sulphur	17.26	22.16	+4.90	+ 28.4%
Sulphidity based on poly- and mono-sulphur, %	24.48	32.80	+8.32	.....
Sulphidity shown by regular mill test, %	21.92	20.85	—1.07	.....
Reduction—mill test, %	78.49	85.23	+6.74	.....
Sulphur make-up added gram per liter white liquor produced				
In salt cake to rotaries	3.03	4.35	...	.....
Elemental sulphur to rotaries	6.08	5.33	...	.....
Total to rotaries	9.11	9.68	...	.....
In salt cake to B & W	5.11	6.70	...	.....
Total to system	14.22	16.38	...	+ 15.2%

*ml. normal acid per 5 ml. sample.
**Method according to Griffin (4).
***By summation.

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The Development of Weatherproof Solid Fiber Board

H. T. BARKER, Chief Chemist
East Walpole Plant
Bird and Son, Inc.

The average quality fiberboard for domestic shipment, available early in 1942, had practically no resistance to water immersion for any extended period. Today there is being supplied V2 grade solid fiberboard with a dry burst of somewhat over 600 pounds, which exhibits practically no loss in bursting strength after 24 hours immersion in water, maintains most of its rigidity, and is capable of delivering goods in a satisfactory condition meeting the severe requirements of war conditions.

The first specification the industry was asked to meet called for 0.100 solid fiberboard with a burst strength of 375 pounds, which would show less than 2 inches of splitting in the glue lines when immersed in water for 1 hour and which would show less than 50% in bursting strength loss and less than 50% water absorption when submerged in water for 2.5 hours. It was soon apparent that such a container was far from satisfactory. War Department complaints on conditions of shipments received overseas indicated that very great increases in requirements would be necessary, particularly in water resistance. During this period, a wide variety of specifications were introduced by various procurement offices. Out of this muddle a general pattern of requirements began to take shape. These were gradually simplified and the present V box specifications were set up. These specifications call for three general classes of solid fiberboard which have been desig-

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nated V1s, V2s, and V3s. The specifications for these boards follow:

	V1s	V2s	V3s
Caliper, nominal, inch	0.100	0.000	0.090
Dry bursting strength, lb	750	550	400
Immersion, 24 hours:			
Bursting strength, minimum, lb.	500	500	150
Splitting, maximum, inch	0.25	0.25	0.25

These classifications provide for two boards, V1 and V2, having very high wet strength properties, one of which, V1, having a very high dry strength. The third class, V3, is a considerably weaker board, both in dry and wet strength.

It was found for some very drastic uses, that none of these boards provide the necessary protection and a type of box was designed, meeting either V1 or V2 specifications, to which was added a sleeve of the same material.

Gradually experience taught the actual use requirements of the various shipping containers. It was found, except for a small proportion of uses, that the V1 board provided over-packing and its use has gradually diminished. The V3 grade was found satisfactory for a large number of uses where a large amount of protection was unnecessary. The bulk of the volume is at present in the V2s grade. This grade accounts for approximately two-thirds of all solid V boxes made, V3s for 27%, and the V1s for 6%.

In order to meet these requirements, it was necessary to make radical changes in the paper machine products and in the adhesives used for laminating. The water absorption of papers was greatly reduced and highly water resistant adhesives were developed. The papermaker early realized that material changes in sizing methods would be necessary to provide the strength and water resistance required.

It seemed most logical that the solutions to the problems should be worked out in such a manner as to use the conventional papermaking and laminating equipment available with a minimum of change in operation. It was from this point of view that most attacks upon the problem were launched.

Several methods of approach to the problem were apparent. It was found possible to produce weatherproof board meeting these requirements using rosin and rosin wax sizes in the conventional manner simply by increasing the amount of size and alum to give the required sizing, usually at the expense of a substantial proportion of paper machine production because of increased operating difficulties. These boards, generally, had high water absorptions resulting in high wet burst loss and poor wet rigidity. It was necessary to produce a board with a very high burst to meet the wet bursting strength requirements. Such a method of producing weatherproof board was wasteful of pulp and board capacity, both highly undesirable in a period of pulp shortage and very high volume requirements.

A second method of approach was to develop new sizing techniques to produce very hard sized boards with high wet strengths. Both asphalt emulsions and wet strength resins have been used with success. The papers were far superior to rosin sized papers in that production problems were less serious and much higher wet strength boards could be produced with attendant pulp and production capacity savings. The principal disadvantage to these boards was rather high water absorption. While far superior to conventional sized boards, in this respect, water pick-up on submersion was great enough to materially lower rigidity. However, such boards easily met all specification requirements and a substantial proportion of the weatherproof solid fiberboard produced has been made by this method.

It became apparent as the weatherproof box developed that the ideal box would be one with high wet strength to which had been added a water barrier which would keep water absorption low enough to cause little loss in rigidity. Asphalt duplexed liners provided the cheapest and simplest solution and the weatherproof box with one or two asphalt barriers was born. At the present time, the major proportion of the V1 and V2 solid fiber boxes are made in this way.

A typical V2s grade board with two asphalt barriers is made up as follows: A four-ply board is laminated using a water resistant adhesive. The plies consist of two asphalt duplexed liners and two hard sized fillers. A V1s board is of similar construction but is usually five-ply, two asphalt duplexed liners, and three fillers, the extra ply being necessary to get the required dry burst. A V3s board is usually made up of four-plies of hard sized papers with no asphalt barriers. Actual compositions will vary widely according to the raw materials available in the individual mill.

A number of sizing tests have been devised to measure quality of weatherproof papers. Two of the more commonly used are the submersion and Cobb tests. The submersion consists in immersing a 6- by 6-inch sample of paper in water at 75 Fahr. for 10 minutes. The submersion number is the centigrams of water picked up. The Cobb test is specified in TAPPI Standard T 441 m-42. Time of exposure is 5 minutes and test is reported in grams per square meter.

V1s and V2s boards made with asphalt duplexed liners will meet specifications if the papers used have a Cobb of 45 grams per square meter and a submersion number of 400. V3s boards without asphalt duplexed liners, can be laminated successfully from papers with a Cobb of not more than 65 grams per square meter and a submersion number of not over 450.

At the same time that the papermaker was learning how to meet the new sizing requirements, the laminator was hunting for adhesives which could be used on conventional laminating equipment and which would provide highly water resistant glue lines. The first satisfactory adhesive developed and the one which is used to the greatest extent at the present time is the starch - urea - formaldehyde resin adhesive. The starch manufacturer, the resin supplier, and the paperboard manufacturer all contributed to the development of this adhesive. Many satisfactory modifications were worked out, but in general the adhesive consists of an acid starch cooked to 195 Fahr. to which is added, after cooling, from 5 to 20% urea-formaldehyde resin. It is possible to extend this adhesive and to vary its viscosity by the use of clay or asphalt emulsion. Under proper conditions the resin can be cooked with the starch.

The starch base used varies from medium boiling starches to dextrines and mixtures of the two. The amount of resin required varies with the type of starch and the degree of water resistance required, and, in general, increases with the degree of conversion of the starch. The resin cures under acid conditions, hence, alkaline starches cannot be used. Because of the absence of heat on most solid fiber pasters, accelerators, usually ammonium chloride, are added to the resin to hasten its cure. Close pH control is necessary to insure curing of the resin which is necessary to develop the waterproofness of the glue line and also to insure against jelling of the resin while in use. In spite of its limitations, it is entirely satisfactory as a weatherproof adhesive and at the present time is being used by a major part of the weatherproof board manufacturers.

Polyvinyl alcohol base adhesives have been introduced for laminating weatherproof board. These adheaives have found considerable favor and are preferred by many mills because of their ease of operation. The adhesive is considerably more expensive than starch-resin. Its economical use depends on its extension with cheaper materials. Both asphalt emulsions

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14	1186	260°	12- 2-38	40,383	2	Replace ball locating bearing and shaft sleeves	Negligible
15	1186	260°	10-11-40	28,839	1	Replace shaft sleeves	Negligible
21	1186	350°	8- 4-39	10,818	0	.....	Negligible
16	1186	260°	1- 2-42	21,475	0	.....	5%

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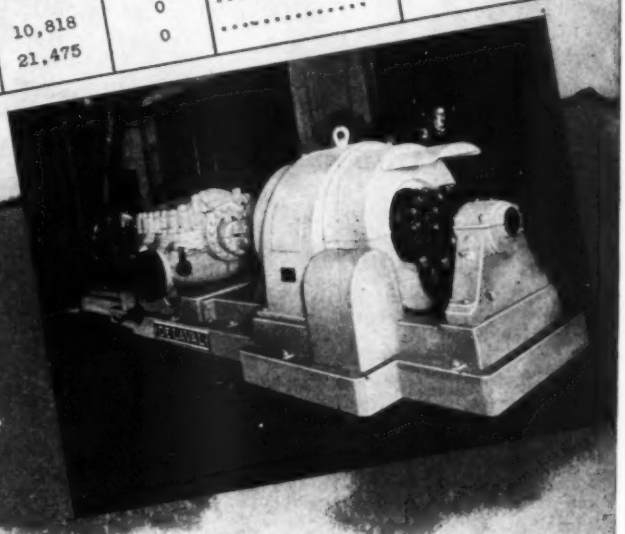

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and starch have been used successfully for this purpose. This adhesive requires less close control than the starch-resin adhesive. The solid adhesive is dissolved in water with heat and agitation, cooled, and asphalt emulsion added. The blended adhesive is then pumped to the paster with no further treatment or control.

The quick frozen food development, promised after the war, suggests many requirements which the water and moisture resistance of the V box should fill. Air shipments of luxuries and perishables is a field with similar requirements. Containers for fresh fruits and vegetables deserve consideration. The know-how gained in producing a very high degree of sizing may find application in the building board field. There is being built up a tremendous demand for housing during this war period. New and better house construction will require a variety of building and structural papers and boards, some of which may be developed from the knowledge gained in the V box development.

The ultimate place of the V type board depend on the ingenuity of the manufacturer to produce a material competitive with existing materials, such as wood or plywood or with new materials being developed in other fields.

Pulps for Pulp-Reinforced Plastics

S. L. SCHWARTZ, J. C. PEW, and H. R. MEYER*

Wood pulp is being used to reinforce phenolic plastics, both in the form of paper and as resin-filled or impregnated pulp preforms. Another article (Schwarz, S. L., Pew, J. C., and Meyer, H. R., Pulp Reinforced Plastics, FPL Mimeo No. R 1461) describes previous work by the Forest Products Laboratory with resin-filled pulp.

With the exception of the Mitscherlich-type sulphite pulp, all pulps used were made at the Laboratory. The Mitscherlich-type sulphite pulp was similar to that used in making aircraft grade laminated-paper plastics.

Spruce kraft pulps were specially prepared for high-strength laminated paper plastics. Aspen and maple krafts were also specially prepared to give high-strength pulps. The sweetgum kraft had been made in other experimental work and was of only moderate strength. The soda, neutral sulphite, neutral sulphite semichemical, and groundwood pulps used in this study were either specially prepared or selected from pulps on hand. Pulping conditions were such that fiber degradation was at a minimum and the pulps were of good quality. Pulps were prepared from water cooked chips. The wood chips were covered with water, digested for 10 minutes at 180 C. (354 Fahr.) and reduced to pulp in a double-rotating disk mill. The total time of digestion was approximately 1 hour.

All chemical pulps were used in the unbeaten state; semichemical and groundwood pulps were used just as prepared without further processing.

Modified pulps for use in this study were obtained in several ways. A pulp flock was made by grinding spruce kraft pulp in a Wiley mill using a screen with 0.5 mm. diameter perforations. A mercerized pulp was obtained by treating spruce kraft pulp for 3 minutes with a 28-to-30% caustic soda solution and then washing it free from the chemical. A neutral sulphide semichemical aspen pulp that was chlorinated with 16% chlorine and extracted with a 7% caustic soda solution also was used.

The same commercial powdered phenolic resin was used in all experiments.

The equipment and method of converting the resin-bearing pulp to the plastic state has been described elsewhere (Schwarz, S. L., Pew, J. C., and Meyer, H. R., Pulp Reinforced Plastics, FPL Mimeo No. R 1461). The pulp, powdered phenolic resin, and zinc stearate (1% of the mixture) were suspended in water, at about 1% consistency. A wetting agent was used to aid in dispersing the powdered material. The stuff was formed into a mat 8.5 inches in diameter in a pressure forming appartus. The amount of resin retained (resin content) was approximately 40% of the moisture-free weight of the mixture. The wet mat was dried in a forced-circulation oven at 35 to 40 C. (95 to 104 Fahr.) for 24 hours, conditioned at 24 C. (75 Fahr.) and 50% relative humidity for at least 24 hours and molded between cauls at 160 C. (320 Fahr.) for 13 minutes, using appropriate pressures determined by trial. All panels were removed from the press when still hot and allowed to cool in air at room temperature.

Strength properties were determined on specimens taken from one to four nominal 1/8 inch thick panels of each pulp-type plastic. In general the number and type of specimens taken from each panel were as follows: two tensile specimens, two compression specimens to determine the elastic properties, four compression specimens to determine ultimate strength, five toughness specimens, and two water absorption specimens. Tests, other than toughness, were made according to the methods outlined in "Federal Specifications for Plastics, Organic: General Specifications (Methods of tests) L-P-406, December 9, 1942." The toughness tests were made on the Forest Products Laboratory intermediate—capacity toughness—testing machine.

Strong and tough plastics were obtained not only with the long-fibered softwood, but with short-fibered hardwood pulps as well. Thus birch neutral sulphite pulp with approximately half the fiber length of spruce, gave a plastic with strengths about equal to those of the spruce kraft pulp plastics. Black maple pulps, with only a quarter of the fiber length of the spruce pulps, also produced strong plastics. Contrary to what might be expected, plastic flow and the required molding pressure of the various pulp-resin combinations were not markedly influenced by the fiber length of the pulp employed. The short fibered hardwood pulps, however, may felt better and may, therefore, be advantageous in the making of pulp-resin preforms by the suction process.

Pulp sheet strength is not important to plastic strength. Thus, spruce neutral sulphite, with an unbeaten pulp bursting strength of 1.03 points per pound per ream, did not give an appreciably stronger plastic than aspen soda pulp which had an initial bursting strength of only 0.35 point per pound per ream.

Mechanical and semichemical pulps were also found suitable for pulp plastics. Groundwood pulps gave plastics with somewhat lower tensile strength and decidedly lower toughness than the best of the chemical pulps. Even groundwood pulp plastics, however, were still greatly superior to wood-flour-filled plastics in these properties. In addition, the high-yield pulp-resin combinations flow well during molding and the resultant plastics had somewhat better water resistance than the chemical-pulp plastics. Plastics made from water-cooked wood chips had only moderate tensile strength and toughness, but they had high water resistance and, especially with aspen, the flow during molding was exceptional. The semichemical pulps tended to give plastics with somewhat low toughness values but otherwise were quite strong. The plastic flow of the spruce sulphite semichemical pulp was very good. High-yield pulps, in general, present interesting possibilities and are being investigated.

Artificial shortening of spruce kraft fibers brought about a great reduction in

*Engineers, Forest Products Laboratory, Forest Service, U. S. Department of Agriculture; maintained at Madison, Wisconsin, in co-operation with the University of Wisconsin.

Bagley and Sewall

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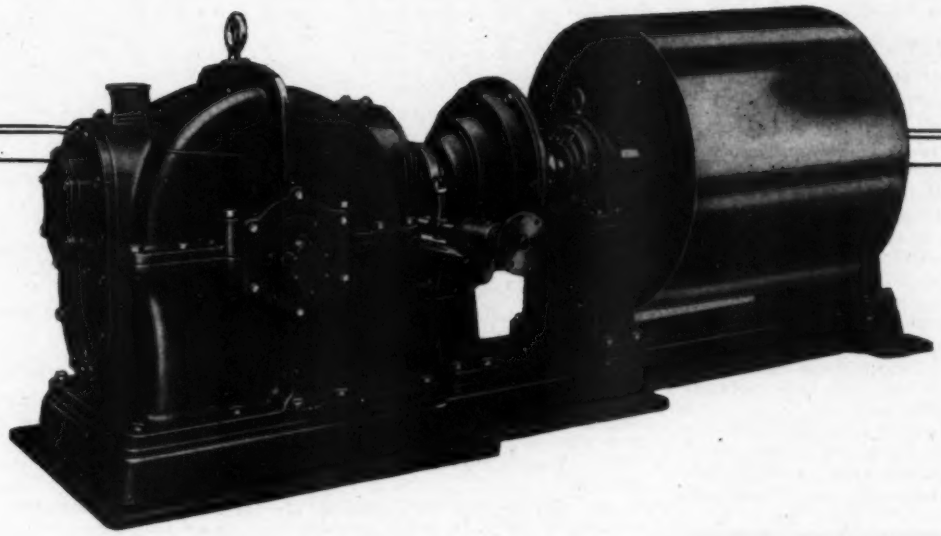

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★

MODERN types of enclosed, all-metal driving units have become so universally accepted by progressive mills that serious consideration should be given to replacement of old type drives.

The design and construction of these modern units provide for extremely low maintenance cost, and make possible a steadier running paper machine. Accurately cut Spiral Bevel or Hypoid gears, mounted on shafts supported by anti-friction bearings, deliver a steady, positive power with a minimum of power loss due to friction and improperly operating gears.

Detailed information regarding these modern driving units is available upon request.

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THE BAGLEY & SEWALL COMPANY

Builders of Paper Making Machines

WATERTOWN, NEW YORK

the molding pressure required and an appreciable increase in flow as compared to that of the original pulp. Toughness and tensile strength of the plastic were reduced considerably but were still relatively high. They greatly exceeded the toughness and tensile strength of wood-flour plastics. In view of the advantages of increased moldability and improved flow, such flocks may have merit.

Properties of the plastic may be altered by the addition of other substances. A mixture of 20% or 50% of glass fiber with black spruce kraft pulp improved the ultimate compressive strength of the product, but with a 50% glass-fiber mixture, the ultimate tensile strength and toughness dropped considerably. Water absorption was decreased by the substitution of glass fiber for cellulosic material.

Properties of the plastic may also be modified by chemical treatment of the pulp. Ultimate compressive strength was raised mercerizing the kraft fiber. Mercerization tends to produce high elongation in tension at rupture.

Vinyl Resin Adhesives Use in Weatherproof Boxes

G. A. WRIGHT, Manager, Technical Service
E. I. du Pont de Nemours & Co., Inc.

Adhesives Nos. 77 and 78 are water-soluble vinyl resin base adhesives which were developed to meet the specific need of the solid fiber industry for an adhesive capable of withstanding the stringent container specifications of the armed forces.

The idea of using water-soluble resins to produce a weather-resistant bond is unique, and the short space of two years has seen extensive commercial utilization of this unusual property of these adhesives. This is one of the wartime developments which may well have important peacetime applications.

These two adhesives are supplied to the solid fiber industry as dry powders, in 50 pound multiple wall kraft paper bags. The dry powdered adhesives do not deteriorate with age, are not hygroscopic and do not cake in the shipping container. An adhesive solution can readily be prepared in the present commercial types of adhesive preparation equipment.

To prepare the adhesive solutions, the dry powder is added slowly to the required amount of unheated water in the mixing tank. The concentration of solids used in each case depends upon local requirements and conditions, i. e., type of equipment, paper, glue station, machine speeds desired, etc. A 20% solution of No. 77 and a 21% solution of No. 78 are the concentrations generally preferred although concentrations as low as 15% and 17.5%, respectively, have been successfully and satisfactorily used. Continual agitation is maintained to slurry the adhesive into the water. Stirring is continued after the last addition of dry adhesive until a smooth, homogenous mixture is obtained.

The cold slurry is then heated to approximately 185 Fahr. and maintained at this temperature for 0.5 to 1 hour with agitation continued. The use of direct steam is preferred to the use of steam coils for heating the adhesive solution although the latter can be satisfactorily used where necessary by employing higher temperatures, longer heating time, and the use of special precautions to assure complete solubility and dispersion of the adhesive. In using an open steam pipe, it is necessary to compensate for the water condensed into the adhesive during the cooking process. The amount of condensation will vary but an approximate allowance of 10% of the total volume of water required is normally satisfactory. After cooking, the adhesive solution is cooled to 100 to 130 Fahr., when it is ready for use. The solution may be cooled with a water spray on the outside of the tank or by transferring the hot solution into a cooling tank equipped with coils.

The prepared adhesives are smooth viscous liquids with considerable tack when employed in thin films. Adhesive solutions prepared as described above and free from borated starches are stable indefinitely and will not lose their adhesiveness when once prepared. The solutions have no objectionable odor nor will they impart any odor to the finished board.

The desirable characteristics of adhesives No. 77 and No. 78, when used in the production of solid fiberboard, may be summarized as follows:

1. Simplicity of adhesive preparation. The adhesives require no pH control nor any additive chemicals.
2. High rate of board production. Machines have been operated as high as 400 feet per minute.
3. Adhesive solution stability. No control is required during preparation, application, nor for normal periods of storage.
4. Produces high quality, firm, dry board with dependable water resistance. The board can be fabricated into boxes in less time than board combined with other weatherproof adhesives.
5. These adhesives will impart no odor to the board nor will they contribute to corrosion of the packaged contents.
6. Reduced waste board production. This saves critical paper.

Some unusual properties of these weatherproof adhesives are as follows:

(a) VI solid fiberboard laminated with No. 77 is resistant to ply separation under prolonged exposure to boiling water.

(b) Adhesives Nos. 77 and 78 have a *p*H in the range of 5.5 to 6.5. These *p*H's can be reduced to 4.4 with alum without any deleterious effect on the adhesive properties. This factor is important since this *pH* corresponds to approximately the lowest *pH* possible because of pickup of alum from the paper in recirculating the adhesive from the glue pan over the paper and back to the pan.

(c) These weatherproof adhesives are generally unaffected by oils of animal, vegetable, or mineral origin. Therefore, they impart a degree of grease-resistance to board laminated with them.

These products are incompatible with appreciable amounts of borax and silicate of soda, large amounts of alum and sudphuric acid, some processed starches, and formaldehyde. Bitusize A-1, some dextrinized starches, and corn starch are compatible with solutions of 77 and 78. Bitusize A-1 is a recommended extender for the adhesives and its use makes possible the reduction of adhesive costs. A composition consisting of 70 parts of No. 78 solution and 30 parts of Bitusize A-1, or 60 parts of No. 77 solution and 40 parts of Bitusize A-1 produces a solid fiberboard of excellent quality with a high wet bursting strength value and no ply separation after 24 hours immersion in water.

While the compatibility of some starches also makes possible the reduction of adhesive costs, their incorporation is not generally recommended and careful control of the formulation must be exercised since they frequently produce an adhesive with inferior water resistance.

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• • •

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• • •

We also manufacture cutting cylinders, anvil rolls, squeeze rolls. We make a specially constructed steam jacketed 2" and 3" pump for handling viscous materials such as filled asphalt, heavy lubricating oils, vegetable oils, paints, etc.

Alkaline Pulping With and Without Pump Circulation

EDWARD H. HILL, Tech. Director
North Carolina Pulp Company

In order to determine the value of forced circulation, several factors must be considered. The outstanding ones to consider are:

1. Size of digester.
2. Volume of liquor used and chemical concentration.
3. Method used to charge digester.
4. Kind and amount of relief.
5. Temperature and pressure used to cook.

ASK THE MEN BEHIND THE PRODUCT

Stein-Hall paper technical field men know their stuff. They know how our materials work in the paper mill as well as in our laboratories. They know what those materials will do for you . . . how they will help you to solve your problems, now and after the war.

There's the problem of post-war demand for high machine speeds and better quality paper and paper products. Stein-Hall superior starches, gums and dextrines for sizing, calendering, coating and adhesive uses will be major factors in solving that problem.

Ask the men behind our materials to tell you why. You can count on these men to work with you for present and peacetime purposes:

J. P. STRASSER, *Mgr. Paper Dept.*

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6. Species of wood and quality of pulp desired.
7. Type of steam inlet.
8. Cooking time and time to maximum temperature.
9. Moisture content of wood.
10. Amount and kind of steam available.
11. Size of blow lines.

To investigate all these factors would take a long time and also would involve too much expense since it is felt that worthwhile data should be taken from mill operations. Very little data are available, and that perhaps would not be if it had not been for certain conditions brought about by the war.

The digesters at the Plymouth mill were at first equipped with indirect heaters. As these heaters developed leaks and could not be repaired because of the time that would be lost in cooking and not being able to purchase the necessary equipment for repairs, the digesters were gradually changed over to direct cooking. The forced circulation was used for a time until it was found that the circulating lines plugged easily and required a lot of attention. To determine just what effect it would have on the quality of pulp if the forced circulation was not used, six cooks were made in the same digester: three with, and three without forced circulation. As nearly as possible, all factors were the same for all cooks except the relief and circulation. The size of the digester was 3140 cubic feet and a total volume of 9,000 gallons of liquor was used. This amount had been found necessary to give clean blows. The pine chips were run in the digester; and while the white liquor was being charged, the chips were allowed to run into the digester. The white liquor and chips were cut off at the same time.

The black liquor was next run into the digester and the cook started.

The digester was brought up to temperature in 2 hours by hand control. At the end of the cooking period, samples were taken out of the blow lines as the digester contents were being blown into the blow tanks at intervals of 2 minutes. These samples were washed and tested for permanganate number by the TAPPI method. The following tables and figures give the results of these tests and show the amount of relief used for each cook:

Table I.—Normal Relief: 98.0 G./L. Total Soda as Na_2CO_3; 2 Hours to Maximum Temperature 177° C; Cooking Time 4½ Hours

Sample	No Circulation Permanganate Number	Circulation Permanganate Number
1	23.8	22.0
2	21.6	19.1
3	21.6	19.6
4	22.4	21.8
5	14.7	20.5

Table II.—Very Little Relief: 99.5 G./L. Total Soda as Na_2CO_3; 2 Hours to Maximum Temperature 181° C.; Cooking Time 4½ Hours

Sample	No Circulation Permanganate Number	Circulation Permanganate Number
1	28.5	21.5
2	27.3	23.6
3	27.0	24.3
4	26.8	24.7
5	22.2	24.7

Table III.—Excess Relief: 97.5 G./L. Total Soda as Na_2CO_3; 2 Hours to Maximum Temperature 183° C.; Cooking Time 4½ Hours

Sample	No Circulation Permanganate Number	Circulation Permanganate Number
1	25.3	19.2
2	24.0	19.1
3	22.5	19.0
4	20.7	18.2
5	15.1	20.6

After these tests were completed, it was believed that there must be something wrong with the top of the digester since the last sample taken from the blow line had shown a much lower permanganate number of every case where the circulation pump was not used. The total liquor charged per digester was next increased to 10,500 gallons, and samples were taken out of three separate digesters that were cooked without forced circulation. The following table gives the results of the tests on the samples taken from these cooks:

Table IV.—Cooks Made with Increased Liquor Charge and without Forced Circulation

Sample	Digester 3 Permanganate Number	Digester 4 Permanganate Number	Digester 7 Permanganate Number
1	24.6	27.2	16.5
2	25.3	26.1	15.8
3	24.9	25.1	15.0
4	23.9	24.7	15.5
5	24.8	25.3	16.5

Note: Pulp from digester No. 7 was used for bleaching.

The foregoing data are insufficient to draw any definite conclusions, and it is a well-known fact that the local conditions at any mill may upset conclusions that are based on any particular set of data when these are transferred from one mill to another; however, from the standpoint of cooking sulphate pulp at the Plymouth mill, it is felt that the following points have been demonstrated:

1. Charging the digesters with insufficient volume of liquor resulted in differences in the permanganate numbers of the pulp in different sections of the digesters when no forced circulation was used. With forced circulation, this condition was corrected.
2. The use of forced circulation gave a slightly softer pulp than when cooked under the same conditions without forced circulation.
3. By increasing the volume of liquor charged into the digester, it was found that a uniform pulp would be obtained from all sections of the digester without forced circulation.
4. Forced circulation did result in making a uniform pulp throughout the digester at a lower volume of liquor which would be a saving in total steam used for cooking.
5. Forced circulation does have advantages. Whether or not it is necessary will depend on many factors which must be analyzed for each particular mill. It is felt, however, that forced circulation is not as important as some manufacturers would want the pulpmaker to believe.

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The Mighty 7th War Loan, the most difficult of all American financial campaigns, opened May 14 and continues through June 30.

KEEP ON BUYING WAR BONDS

Industrial Relations Program for Waxed Paper Industry

P. J. MASSEY

The subject of Labor Relations today is foremost in importance to our industry and all other industries. Yet, as important as it is today, the part it will play in postwar years will be even greater because the success we have in establishing and maintaining industrial peace and high productive labor hours, will be in direct ratio to the time, study and planning we give this subject now.

It is axiomatic that, to properly direct any activity, you must know its component parts. Our collective success in meeting this problem rests mainly on our thorough understanding of it, not only as applied to our individual units but to the industry as a whole.

The main integral factors, governing the study and exploration of Labor Management relations are: (1) A sound national labor policy; (2) A sound company

*Abridgment of paper presented before a meeting of the Waxed Paper Institute, Inc., held on April 12-13, 1945, at Waldorf-Astoria Hotel, New York City. Mr. Massey is Vice President of H. P. Smith Paper Co., and Chairman of the Industrial Relations Committee of the Waxed Paper Institute, Inc.

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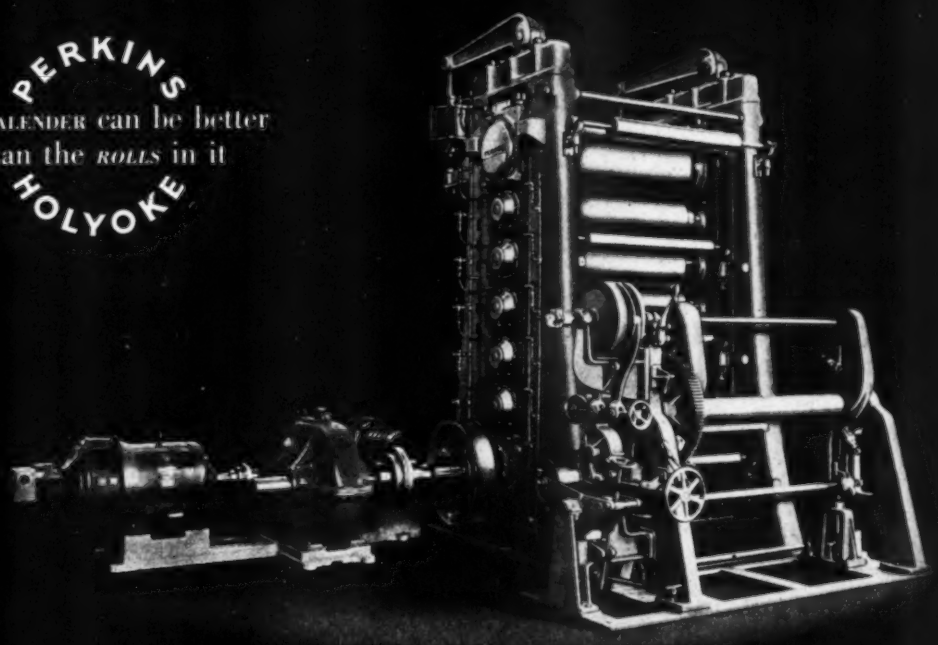

PERKINS

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LARGEST MANUFACTURERS OF CALENDER ROLLS IN THE WORLD

labor policy; and (3) A sound industry plan of job analysis and labor statistics.

We have had revolutionary changes in our National labor policies in the last ten years to such an extent as to bring about a chaotic condition never before experienced in organized society. In a period when wages, benefits and legal rights granted to labor have been without parallel and machinery for the adjustment of disputes has been made available, the fact that we have had 400% more strikes, is significant of the present situation.

Every employee should be protected in the right to work without intimidation and coercion directed against him or his family, and protection from reprisals from any groups and organizations. If these principles are incorporated into our present legal structure and supported with reasonable law enforcement and penalties, it will, in a large measure, eliminate many of the ills of the present national policy. The membership as individuals and the Institute as an association must exert all efforts to assist in the consummation of this goal as a solution to our present conditions.

The character and spirit of the labor policies, each and every company in the Institute actually practices and holds to mold true labor-management relationship within its own plant is a great responsibility on each and every one of us and the principal means of combating the present disorganized conditions.

A great many changes have taken place in organized society in the last five years and it is up to management not only to know what these changes are but to know the rights of the individual workers and make applicable such policies as will best interpret these rights.

The interpretation and selling of these policies should be by personal contact through frequent plant visits, personal talks to individuals or groups of workers, letters on the bulletin board and the shop paper, and personal contact through employee dances, picnics, ball games and the like. None of these activities are new to you. They are only mentioned to emphasize the need for your close co-operative relationship to your employees if we are to be successful in bringing about orderly labor policies in our industry.

We are in a period of high standards for labor which are going to be higher in the postwar period. Now, what is a high standard for labor? It is purely a relative matter. We should not be too concerned with a high standard hour rate in the postwar period, providing it fits into our very complex economic system and not throw same out of gear by increasing our unit costs.

A standard nomenclature and a standard description and classification of jobs must be established through a uniform system of job evaluation. There may be a little resistance here and there to an industry-wide job evaluation, but this resistance can be met by outlining the advantages of this management tool. One thing definitely in its favor is the fact that it points out quite conclusively the factors that make up a job. Once a good and complete description of a job is set down, the rest is comparatively simple. It further provides management with a common language and yardstick in comparing jobs with one another; it provides a basis for the exercise of sound judgment in the establishment of a rate; it provides a concrete basis in discussing a job in collective bargaining negotiations, and it is being regarded more and more by most business enterprises as a necessary and valuable tool in the administration of a wage policy.

In addition to a standard job evaluation system, consideration should be given to the following phases of a program: Exchange of Wage Rates and Exchange of Union Contracts, Vacation Policies, Insurance Plans; Pension Plans; Profit-Sharing Plans; Incentive Plans, Association Benefit, etc. Some companies may be reticent in divulging such information; however, experience has proved it only works to their advantage. It develops a feeling of better understanding and a co-operative spirit. Take for example the exchange of Union Contracts. One company may have a contract with a number of desirable features that other companies may not have but would like to incorporate. Again, one company might have a vacation policy that has certain desirable features that other companies might like to adopt, either in part or whole. These items will undoubtedly suggest others and the advantages of such interchange would outweigh any disadvantages.

Quarterly meetings of the operating heads of member companies would be beneficial. With the labor relations picture changing as it is from day to day, it would seem advisable to hold such periodic meetings so members could have the opportunity to informally exchange experiences across a conference table; also to discuss new regulations.

The trend of the War Labor Board today is to consider rates and systems industry-wide when dealing with individual plants and is urging that one standard system of job evaluation be adopted by all those in the industry.

The War Labor Board will deal with each company individually with respect to their individual problems, but only in connection with the standard job classification prevailing in the industry. They say that the industry pattern will make it possible to give intelligent consideration to each individual company and the industry as a whole, in their dealings with labor.

We do not necessarily recommend a particular system because it is the only one applicable to our industry. However, there are many advantages in the adoption of one method especially when this method has been in use for the last eight years and is the system already successfully in operation in five typical waxed paper plants and is in the process of being installed in two more.

Added advantages of adopting this system for the industry are:

A. It is already approved by the War Labor Board in two regions and is satisfactory to the Unions concerned therein.

B. If adopted, there will be a saving of time and cost in getting this system into work throughout the industry.

C. There will be a saving in money to individual member units. We are advised that by the use of the data from installations already made, new applications can be made at a lower cost. A very considerable saving can be made in arriving at a standard measurement and compilation of a Job Analysis Manual for the industry.

Our suggestion is that after a few more individual job evaluations for companies considered typical of the three divisions of the industry are completed so as to be sure that we have included all jobs, we then prepare a manual of standard methods of job analysis and classifications. The manual should be in simple form so that each company, or an engineer of its selection, can install or extend the system with its own personnel. This procedure will insure that all rates reported will be calculated on the same basis and same nomenclature.

If the cost of additional job evaluations to complete the manual are to be borne by the Institute, the Executive Committee could decide which plants would be used for this purpose and what portion of the expense would be borne by the Institute or by agreement, charged to said plants. However, I believe the companies who have already made the installations realize they have full value for installation expenditure and would be more than recompensed for the persevering by the added advantages of the general adoption of their system by the industry.

We offer safe, economical solutions to all pulp and paper mill drainage problems with our twill weave, plain weave, sewed seam, and soldered seam wires.

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Menasha, Wisconsin

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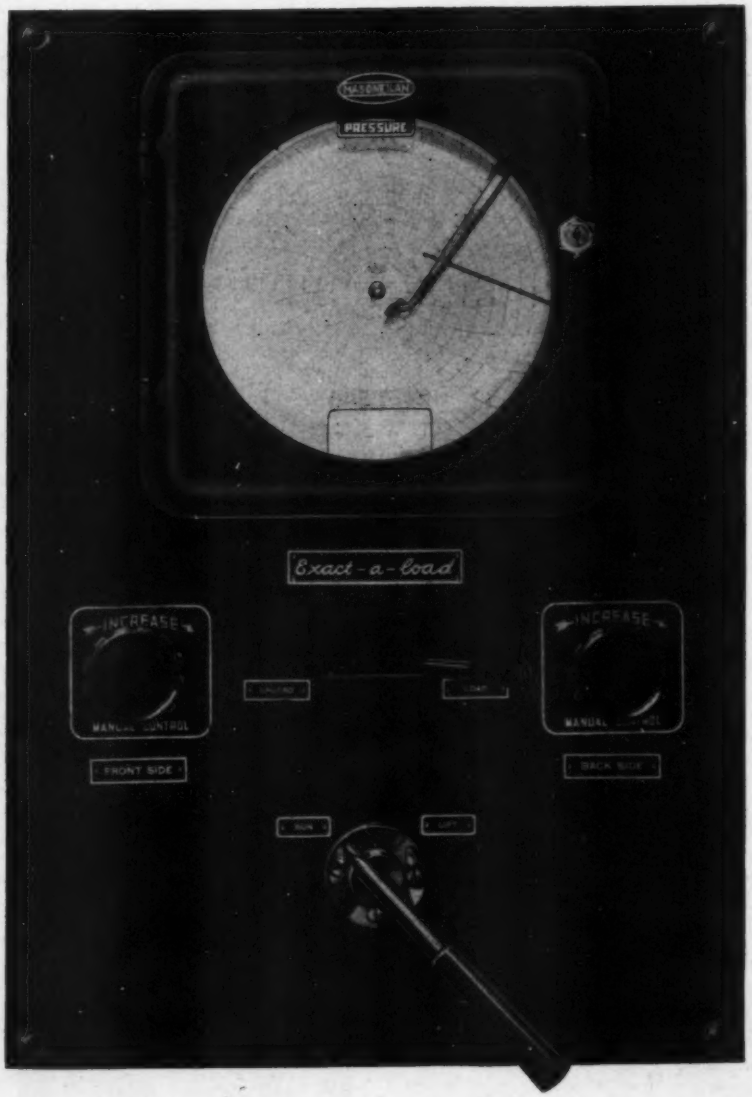

Exact-a-load Roll-Loading offers improved control, wide application and increased economy.

Used for pneumatic loading of wet presses, squeeze presses, calender and super-calender stacks, Exact-a-load enables you to produce—and duplicate—better quality paper, with fewer rejects and with reduced roll maintenance. Exact-a-load is easy to install and maintain—more than pays for its moderate initial cost in a short time.

And Here Is Why...

EXACT-A-LOAD SAVES TIME:

In loading and unloading the rolls.

In securing proper adjustment.

In keeping the operator informed at all times, by providing visible record of applied loading.

EXACT-A-LOAD SAVES PAPER:

By maintaining desired loading pressure on both front and back of the rolls.

By preventing damage to felt when crushes occur because of fast simultaneous unloading of both ends of the roll.

Available with diaphragm motor or air piston load applicators. Types for load and unload; or run and lift, or both. Take this forward step toward making your job easier, more productive; ask for your copy of Bulletin PD-102 and supplementary data.

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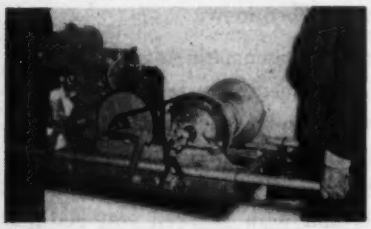
NEW EQUIPMENT AND SUPPLIES

Portable Donkey

C. & J. Equipment Co., Tillamook, Ore., has announced the *C & J portable donkey* for various logging operations as well as other hauling work. The donkey consists essentially of a drum, a power unit for driving it, and a length of cable.

Either 1/8 in. or 3/16 in. aircraft cable is used. The drum capacity is 1,700 ft. of 3/16 in. cable or 4,000 ft. of 1/8 in. cable.

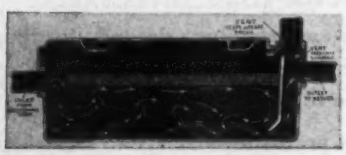


The donkey is equipped with two pairs of handles, a pair at each end, and is of a weight that permits it to be carried by two men.

According to the manufacturer, the donkey has a line pull equivalent to that of at least ten average men. This pull can be varied 50 per cent either way by a changing of sprockets.

Grease Interceptor

An interceptor, designed to prevent fatty substances adhering to pipe lines or plugging up sewer lines, has been announced by D. J. Murray Manufacturing Co., Wausau, Wis. According to the manufacturer, the interceptor is easy to install and easy to clean (cover held on by swing bolts may be removed and the

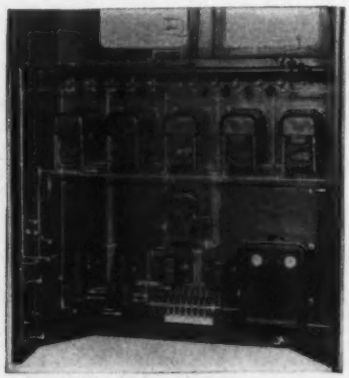


inside parts cleaned without stopping the water flow). The manufacturer also states that the contents of the interceptor cannot be siphoned into the pipe lines or sewer. Tested and certified on the basis of over 90% grease retention, the interceptor is covered by three United States Patents—Nos. 2,057,203; 2,102,429, and 2,102,430.

Prefabricated Boiler Control Panel

Bailey Meter Company, 1050 Ivanhoe Road, Cleveland 10, Ohio, has announced a prefabricated boiler control panel. This panel includes all the necessary connecting piping and electrical wiring for the operation of metering equipment and boiler control systems.

Small units such as valves, relays, switches and signal lights, and the more sturdy and light-weight instruments—are mounted and connected ready for service. Heavy instruments or instruments having delicate mechanisms are shipped separately; but cutout spaces, drilling and all necessary connections are provided.



According to the manufacturer, this panel saves installation time, insures the use of suitable materials, reduces total installed cost, and presents a neat, pleasing appearance.

Stock Handling Cart

Lyon Metal Products, Inc., Aurora, Ill., has announced a stock handling cart for use in stock rooms, tool rooms, shipping departments, etc. The cart illustrated (Model No. 2000-11) is 30 in. long, 16 in. wide, and 32 in. high. It is finished in green baked enamel and is shipped set up.

Coating Machine for Paper Machine Grouping

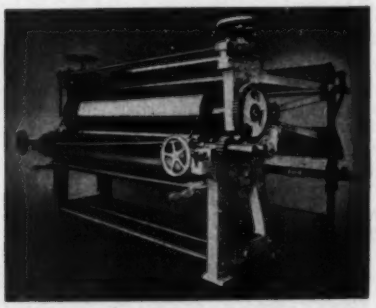
A coating machine, designated as the Waldron *Synchroset* and designed for installation in a paper machine grouping or in relation to a Yankee dryer, has been announced by the John Waldron Corporation, New Brunswick, N. J.

The coater consists of an arrangement of an engraved roll, a resilient furnish roll, an offset roll, and a backing roll. The resilient furnish roll, which rotates at relatively low speed even when the web of paper may be passing through the machine at 600, 800, or 1,000fpm, feeds the coatings material from a pan to the engraved roll. The offset roll, which is of large diameter, receives the coating from the engraved roll and transfers it to the face of the paper web.

The engraved roll is capable of applying six to seven pounds of coating to a ream 25 in. by 38 in.—500. It distributes the coating onto the offset or transfer roll in a printed pattern which is merged in a uniform film by passing the web through the nip formed by the offset roll and the backing roll. The face of the web is pressed to the face of the offset roll.

In the event of a paper break, automatic controls relieve the engraved roll and backing roll from contact with the surface of the offset roll and the paper web. Individually controllable pressures permit proper alignment of all rolls.

Dependent upon the design of the machine, paper can be coated on one side

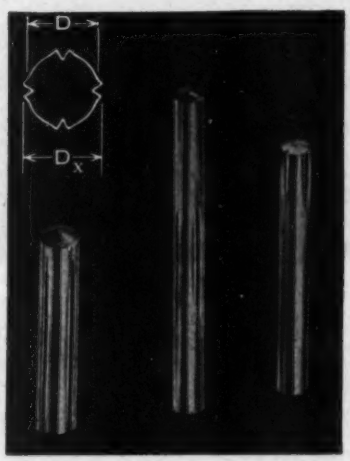


and then on the other, on the same side with two or more applications, or on both sides simultaneously.

The machine, according to the manufacturer, will handle book, litho, magazine, newsprint and paperboard.

Self-Locking Pins

The Driv-Lok Pin Company, 565 W. Washington Blvd., Chicago 6, Illinois, has announced a line of standard and special self-anchoring, vibration-proof pins de-



signed to replace taper pins, keys, cotter pins, set screws, rivets, etc. These pins, which are pressed or driven into standard drilled holes, have four flutes on the surface parallel to the axis.

The flutes provide an expanded diameter of a few (specified) thousandths

Powell Valves
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Every day thousands of valves of all types, designs and materials are "comin' through" the various stages that make the name "Powell" on a valve the hallmark of quality. Into every step—from perfect casting to final merciless testing—goes the KNOW-HOW of 99 years of concentration on making valves—and valves only—for industry.

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1453

457

1469

171

Fig. 457—125-pound All Iron Globe Valve with flanged ends, outside screw stem, bolted flanged yoke and regrindable, renewable iron disc.

Fig. 1469—125-pound All Iron Quick Opening Gate Valve with flanged ends, sliding stem and bolted flanged yoke.

Fig. 171—150-pound All Iron Globe Valve with screwed ends, union bonnet and regrindable, renewable iron disc.

Fig. 1453—125-pound All Iron Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge double disc. Also available with solid disc—Fig. 1816.

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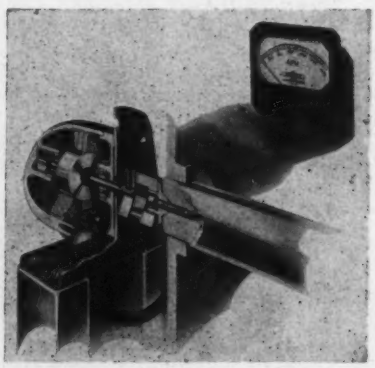
greater than the nominal diameter of a pin. When the pin is inserted in a drilled hole, these raised edges are compressed inwardly, providing a resilient, self-locking element which it is claimed, will hold indefinitely under vibration or shock conditions.

The pins are available in sizes from 3/64 in. to ½ in. in diameter, and from 3/16 in. to 4½ in. in length, in any material and in a wide variety of types.

Electric Speed Indicator

Reliance Electric & Engineering Co., 1078 Ivanhoe Road, Cleveland 10, Ohio, has announced an electric speed indicator for speeds from 100 rpm to 5000 rpm. The instrument consists of two units: a



pick-up unit, and an indicator. The pick-up unit, a miniature six-pole alternator with a permanent magnet rotor, is mounted on the shaft to be checked for speed. The indicator, a permanent magnet, moving-coil type, meters the pick-up output on a 3¾ in. scale.

The indicator may be located at any distance from the pick-up. It may be panel or bracket mounted.

Where desired, scales may be had to read in feet per minute, process cycles of varying times, etc., rather than rpm.

Flax Packing

Greene, Tweed & Co., Bronx Blvd., at 238th St., New York 66, N. Y., has announced *Palmetto Square Flax Packing*. Previous to plaiting the flax strands into the finished packing, each single strand is internally lubricated with high grade tallow. According to the manufacturer, this process produces a packing which will resist hardening and which will give long service with a minimum of wear on the equipment in which it is used.

The packing is available in regular form or in a graphited style.

Car Puller

American Engineering Company, Philadelphia 25, Pa., has announced its *Class 2½ Lo-Hed Car Puller* for use in hauling railroad cars, dragging logs, and other hauling operations where such a device can be employed. The barrel, gear box and motor of the puller are integrated in a single, streamlined unit. The starting line pull is 5000 lb., using a single line, or more with various block combinations.

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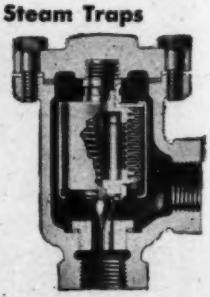
Fingertip-Control Blow Guns

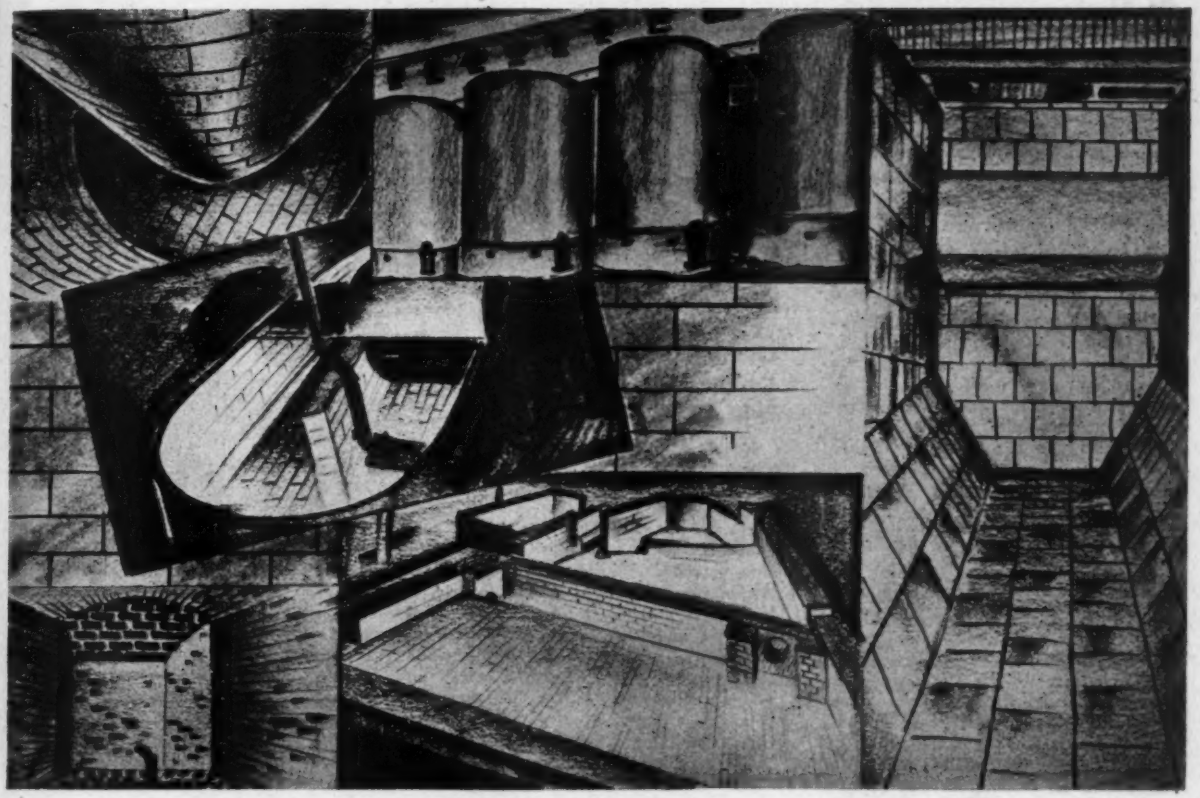
The B. F. Goodrich Co., Akron, Ohio, has added a complete series of Lonn blow guns to its line of industrial hose. These guns are offered in several styles with various degrees of flow or restricted flow for hose applications where air or fluids are used under pressure.

The valve used with each of these guns involves only three working parts. It is opened or closed merely by flexing the rubber nozzle of the gun or hose.

New Line of Steam Traps



Sarco Company, Inc., 475 Fifth Ave., New York 17, N. Y., has announced a new line of thermostatic steam traps. Using single, large diameter bellows and for inlet sizes ½ in. to 2 in. inclusive, the traps are available in two pressure ranges: No. 9-100 for pressures 0 to 100 psi, and No. 9-225 for pressures 0 to 225 psi.



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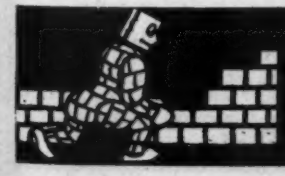

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TECHNICAL DEVELOPMENTS

These abstracts are of the latest developments found in the American and foreign press.

Sulphur Spray Burner

The recently installed Fraser Companies, Limited, spray sulphur burner is compared with the old type rotary. Advantages of the new burner include: simplicity of operation, briefer shutting up and starting periods, the maintenance of a higher sulphur dioxide concentration, elimination of sublimed sulphur, lowering of the percentage of sulphur trioxide (thus leading to the virtual elimination of calcium sulphate formation in the digesters), general reduction of sulphur losses, and economies in the use of steam. R. B. Murchie. Pulp and Paper Mag. Canada 45, No. 13 (Dec., 1944).

Simple Equipment for Determining Water Vapor Permeability

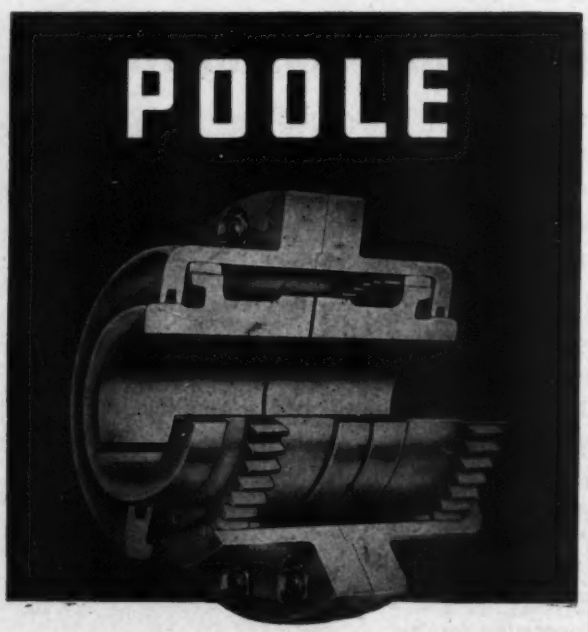
The chamber used is a desiccator containing sulphuric acid, and the containers which hold the water, and over the tops of which the paper test sheets are clamped, are made of aluminum or of magnalium. Determinations may be made in quadruplicate, and the water vapor permeability is recorded in grams per square meter per 24 hours. The author gives 38 references. August Noll. Papier-Fabr. Wochbl. Papierfabr. (1944), No. 5, 151-3. (Reprinted by the Alien Property Custodian.)

Changes in the Chemical Composition of Sulphite Pulp During the Cook

The original coniferous wood used in these studies contained 10.7% mannan and 8.4% pentosan, and several cooks were made. In a digestion in which the liquor contained 5.28% sulphur dioxide and 0.92% lime, and in which the maximum temperature was 142 C., the so-called "defibration point" was reached after 9 hours. At this stage of the cook, the stock retained 9.8% lignin, 6.2% mannan and 5.25% pentosans. Almost identical results were obtained in another cook run under similar temperature conditions in which the original liquor contained, however, 3.84% sulphur dioxide and 0.81% lime. The degree of polymerization (d.p.) at the defibration point was about 1,900 and the Johnsen-Noll number (indicating the degree of pulping) was about 89. However, when a cook was run using a liquor containing 5.12% sulphur dioxide and 0.9% lime but a maximum temperature of 124 deg., the defibration point came much later (after 15 hours) and the degree of pulping at this point was 79.

In the two cooks run at 142 degrees, the rates of decrease in the d.p. were almost identical and the data indicate that the cooking temperatures is far more critical in determining the chain length of the cellulose than is the time of digestion or the cooking liquor composition. There appears to be a certain parallelism between the changes in tensile strength and the decrease in d.p., but the author makes it clear that a pulp having a high d.p. is not of necessity a stronger pulp than one with a lower d.p., because the hemicellulose content is an important factor. Even before the defibration point of the wood is reached, over 60% of the mannan and pentosan contents are lost.

Data show that although in the earlier stages, when the Johnsen-Noll nos. are still within the range of 90 to 60, the mannan and pentosans change linearly with the degree of pulping, the removal of these hemicelluloses is more rapid during the latter stages of the cook. After digesting for 16¾ hours, with maximum temperature of 142 deg., the pulp contained 0.9% lignin, 3.5% mannan, and 2.7% pentosans. The degree of pulping (Johnsen-Noll) was 19. At various stages of the digestion there appears to be a certain relationship between hemicellulose content and d.p. The author emphasizes



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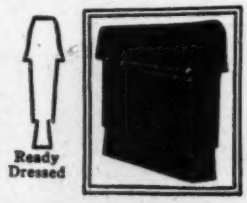

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Draper's

ATLAS OF AMERICAN PAPERMAKING

No. 6 PUBLISHED BY DRAPER BROTHERS COMPANY • CANTON, MASSACHUSETTS

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HIGH LIGHTS:

The earliest paper mill in Rhode Island was established in 1780 by Samuel Thurber, at Providence, but the industry has never grown extensively in this State, although the art of coating and glazing paper has for many years been a prominent industry in Pawtucket. Here, there are seven of these converting plants. As early as the census of 1820, mention was made of "two paper-staining manufacturies" in Rhode Island. But at the present time the only paper mill in the State is that of Bird & Son, Inc., at Phillipsdale.

Rhode Island, nevertheless, will be remembered in the history of paper manufacture, as having had the first sulphite pulp mill in the United States. In 1882, Charles S. Wheelwright, formerly a member of the firm of George W. Wheelwright & Son, obtained the rights to manufacture sulphite pulp under the Ekman process, which he had observed in Bergvik, Sweden. He organized the Richmond Paper Company, at East Providence to manufacture both paper and pulp.

Associated with him as chemist was the late, celebrated Arthur D. Little, and as mill superintendent, John Luke, later one of the founders of the West Virginia Pulp & Paper Company. It has been authoritatively stated that the sulphite pulp produced by this company was of excellent quality, but difficulties were encountered by these pioneers in securing a practical type of digestor. The cost for repairs on their apparatus ate up the profits so fast that in 1887 the company failed.

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both the importance in these studies, of d.p. and of Höpner's total hydrolysis method for evaluating hemicelluloses. Ferdinand Wultsch. Papier-Fabr. Wochbl. Papierfabr. (1944), 128-31, authorized reprint through the Alien Property Custodian.

Utilization of Lignosulphonic Acids

This is a review on the isolation and utilization of the lignosulphonates from waste liquors, in which the author gives 126 references. James M. Pepper. Pulp Paper Mag. Canada 46, 83-91 (1945).

Steam in Corrugating Machines

Basic principles are outlined together with some recent steam-handling systems for corrugating machines. Steam is used for moistening and preheating the corrugating material before it enters the corrugating rolls. It is also used for maintaining temperatures on the outside surface of the corrugating rolls, pressure rolls, preheating elements, and the heating plates in the double-facer. The heating functions present the more complex problems. Efficient use of steam for heating purposes requires that the condensate as well as the non-condensable gases be removed promptly. It is well understood that the condensate must be removed but it is not so well appreciated that the non-condensable gases must also be removed and so the means for their removal is often inadequate. Only in recent years, with increasing operating speeds, has the problem become acute. The author discusses the rate of heat delivery and the quality of steam as it exists inside of the corrugators, with special reference to the efficiency of the heating elements. The steam should be reasonably dry and carry the minimum of non-condensible gases. Appreciable accumulations of such gases within the machine must be prevented by providing a high rate of flow, rapid circulation and a very high degree of venting. At the higher heat transfer rates, far better circulation and venting are required than are provided for by conventional drainage systems. The author describes early trap systems, their improvement and the most modern systems, the operations of which are described briefly. Particular emphasis is placed upon the advantages of the trap and shower-vent system. Walter J. Goettsch. Fibre Containers, 30. No. 3, 24, 26, 31-2, 34, 36-8 March (1945); through B.I.P.C. 15, No. 9, 327-8 (1945).

Molding Compositions from Cellulosic Agricultural Residues

The residues studied included corn stalks, corncobs, wheat, rye and oat straws, flax shives, bagasse, and tobacco stalks. In various experiments, these were cooked with water, with dilute sulphuric acid, with aniline, and with alkali-furfural mixtures. Hydrolyzed oat hull residues from commercial furfural manufacture were also used. The resulting products were then plasticized with the following: aniline and furfural, phenol and furfural, and with furfural alone. These various treatments gave rise to 148 different molding compositions. Those obtained from water digestion and from acid hydrolysis had very similar flexural and impact characteristics, which were superior to those of compositions made by using aniline as hydrolyzing agent. However, the aniline compositions showed better plastic flow and better resistance to water absorption. The alkali-furfural method, in its present form at least, appeared unsuited for the production of molding compositions. Type of treatment and the type of plasticizers used appeared to have a much greater effect on the final properties of the molding compositions than did the origin of the initial cellulosic raw materials. In many instances these could be used interchangeably. The tabulated data given are very comprehensive. Twenty-four recent references are included. T. F. Clark and S. I. Aronovsky. Modern Plastics 22, 162-4, 198 (Dec. 1944).

Artificial Sponges

The sponges are usually made from pulp by the viscose process although other techniques have been suggested. A number of methods of sponge production are described. The sponges have the following advantages over the natural sea sponges: They are more absorbent and are free from sand, last longer because of resistance to alkali and soaps, are less liable to harbor microorganisms, and are easier to dry. The sponges may also be used for packing, as insulating material, for filtration, etc. C. A. Minor. British Plastics 16, No. 187, 549-50 (1944).

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IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

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Suction Roll

Patent No. 2,348,340. John E. Goodwillie and Earl E. Berry, Beloit, Wis., assignors to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin. Application February 13, 1941, Serial No. 378,712. 8 Claims. (Cl. 92—53).

5. In a suction roll including a suction box, a perforated shell rotatably mounted therearound, and seals including offgoing and oncoming seals between the shell and box defining a localized suction area on the shell, the improvement of a wall between said seals extending from adjacent the oncoming seal across said suction area to terminate in spaced relation from the offgoing seal, said wall being spaced inwardly from said shell in diverging relation thereto to define a confined path increasing in capacity as it approaches the offgoing seal and communicating at its point of greatest capacity with the interior of the suction box.

Paper

Patent No. 2,348,686. Clarence V. Van Epps, Lockport, N. Y., assignor to The Lauxite Corporation, Lockport, N. Y., a corporation of New York. No Drawing. Application March 27, 1940, Serial No. 326,286. 2 Claims. (Cl. 95—8).

1. Paper having a sizing of urea formaldehyde resin including up to about 1 per cen taluminum sulphate based on the dry weight of the urea, and a light sensitive coating applied over said sizing, said sizing rendering the paper non-absorbent to water and non-curling in the presence of water and being chemically inactive to deteriorate the light sensitive chemicals of said coating.

Stock Feed for Papermaking Machines

Patent No. 2,344,281. Earl E. Berry and Lloyd Hornbostel, Beloit, Wis., assignors to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin. Application January 20, 1939, Serial No. 251,887. 27 Claims. (Cl. 92—44).

1. A stock feed device for paper making machines comprising an open ended housing defining an elongated cylindrical chamber, a stock conduit extending through said chamber in spaced relation from the walls of the housing, end caps disposed around said conduit closing the ends of the housing annular bearings in said end caps having their inner peripheries in spaced relation from the conduit, cooperating annular bearings disposed around the conduit, a foraminous drum mounted between the cooperating pairs of bearings and extending along the housing in spaced relation from the housing walls and from the conduit, said bearings sealing the interior of the housing from the end caps, said conduit having openings along the length thereof between said bearings, a ring gear in one of said end caps secured around the end portion of the recticular drum and a spur gear meshed with said ring gear for driving the drum in the housing around the conduit.

Papermaking Machine

Patent No. 2,339,711. Donald V. Lowe, Ridgefield, N. J., John Warren Vedder and Charles S. Adams, Worcester, Mass., assignors to Rice Barton Corporation, a corporation of Massachusetts. Application April 4, 1940, Serial No. 327,856. 4 Claims. (Cl. 92—43).

1. A paper making apparatus comprising a vat, a cylinder rotatably supported near the top of the vat which has an open mesh surface for the formation of a paper web thereon, means providing an outlet for white water passing into the cylinder and means providing for an overflow of excess stock at the top of the vat, said vat having inlet walls defining a narrow, horizontally elongated, inlet passage beneath and parallel with the axis of the cylinder and being shaped as a hopper having its sides at the inlet substantially vertically below the cyl-

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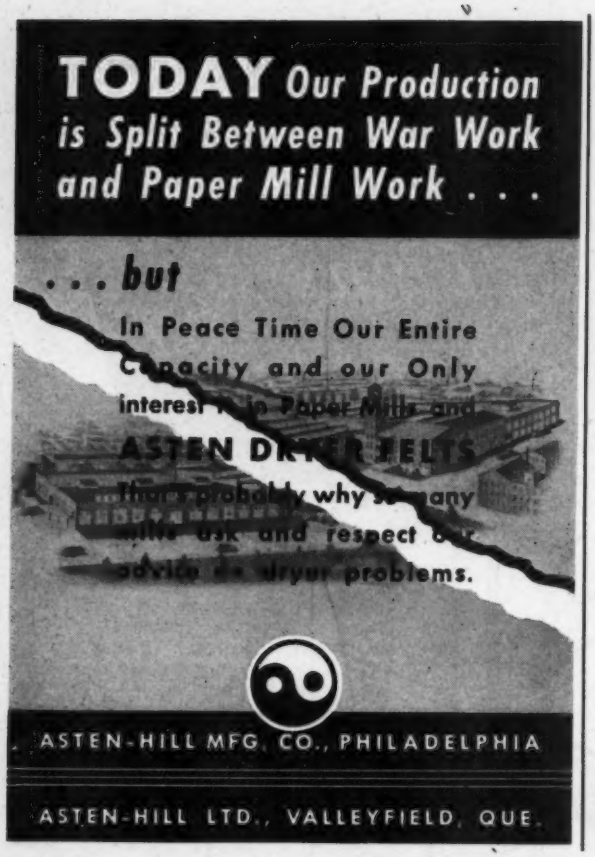
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inder and medially thereof and flaring to positions closely adjacent to the periphery of the cylinder, so as to provide a slowly moving, quiescent mass of pulp and direct inder and distribute it uniformly on both it upwardly towards the bottom of the cylsides thereof.

Pulp Machine

Patent No. 2,344,047. John C. Lowe, Quakertown, Pa., assignor of one-half to Harmer R. Lutz, Borough of Sellersville, Pa. Application May 27, 1941, Serial No. 395,457. 7 Claims. (Cl. 92—20).

1. A paper pulp machine comprising an imperforate cylindrical casing and a pair of perforate drums rotatably mounted in the casing in longitudinally spaced relation to each other, said drums being open at their adjustment ends and oppositely rotated for causing a circulation of the mix in the drums from one to the other through the open ends thereof.

Apparatus for Coating Paper

Patent No. 2,329,034. Ashley Wallace Buck, Plattsburg, and Floyd S. Finch, Hudson Falls, N. Y., assignors to Imperial Paper & Color Corporation, a corporation of New York. Application January 15, 1941. Serial No. 374,480. 4 Claims. (Cl. 91—50). 4. An apparatus for coating paper and the like which comprises a rotatable transfer cylinder for applying a coating material to the paper, means for applying the coating material to the surface of the transfer cylinder, means for drawing the paper under tension over a substantial arc of the surface of the transfer cylinder and in intimate contact with the coating material thereon, said arc being at least 10°, means for adjusting the arc of contact between the paper and the transfer cylinder, and means for rotating the transfer cylinder in the same direction as the travel of the paper and at a peripheral speed substantially less than the speed of travel of the paper.

Method of Sizing Paper

Patent No. 2,354,662. Robert S. Bryce, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey. No Drawing. Application July 16, 1941. Serial No. 402,719. 6 Claims. (Cl. 117—156).

1. A method of sizing paper which comprises treating it with gelatin and a dihydroxymethyl urea both in dilute aqueous solution and subsequently subjecting the paper to a temperature which will liberate formaldehyde from the dihydroxymethyl urea without decomposing the cellulose of the paper.

Pulp Beater and Selector

Patent No. 2,340,720. Harold Donald Wells, Glens Falls, N. Y. Application June 27, 1942, Serial No. 448,777. 5 Claims. (Cl. 92—22).

1. A pulp beater and selector comprising a tank having an upwardly open channel in its bottom extending substantially between opposed portions of the tank side wall, the sides of said channel being inwardly spaced from two other opposed portions of said tank side walls, the bottom of said channel having upwardly turned ends, said channel being provided with a substantially semicylindrical screen forming an extended portion of its length, circulating means mounted longitudinally in said channel in wiping relation with said screen and having portions over said upwardly turned ends of said channel bottom, means under said screen for receiving the pulp discharged therethrough, and means projecting upwardly from the tank bottom between said channel and said two other opposed portions of the tank side wall to prevent trash on the tank bottom from moving laterally into said channel.

Paper and Its Production

Patent No. 2,337,887. Otto Hansen, Mannheim, and Hans Scheuermann, Ludwigshafen-on-the-Rhine - Oggersheim, Germany, assignors, by mesne assignments, to General Aniline & Film Corporation, New York, N. Y., a corporation of Delaware. No Drawing. Application August 22, 1939, Serial No. 291,330. In Germany August 25, 1938. 6 Claims. (Cl. 117—156).

5. In the process for producing paper products of improved fastness to light, high folding value and wet strength, the step which comprises adding to the sizing of the paper material in the pulp, a product obtainable by the action of a monochloroacetic acid alkali metal salt on wood pre-treated with an alkali hydroxide and from which substantially no constituents have been removed by this pre-treatment.

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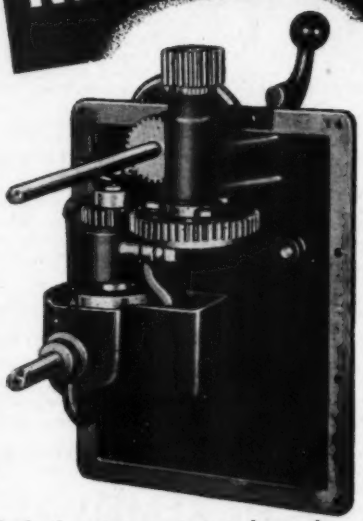

Close-up view of GK Transmission, showing positive jaw-type clutches employed in reversing gear.

Production goes up—costs go down, when a GK handles your knife and shear blade grinding. *Smooth-reversing* means an edge that's absolutely straight and accurate—the first time! There's no possibility of slippage, when reverse is made by the GK's simple, clutch type transmission, with separate shock absorbing clutch.

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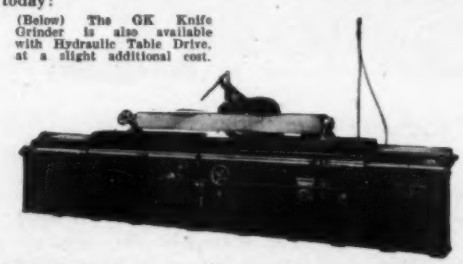

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New Catalogues and Publications

American Manganese Steel Div., American Brake Shoe Company, Chicago Heights, Ill.—Just issued by this company is a 32-page illustrated bulletin, No. 1144-NM, "Non-Magnetic Applications for Amsco Manganese Steels," which is the first comprehensive work on the subject. In this circular are presented studies, with illustrations, of typical applications where non-magnetism and the ability to withstand shock and wear are equally vital factors in the selection of manganese steel. The story of manganese steel and the company's research facilities are also covered in this bulletin, which may be had upon request to the above address.

Burrell Technical Supply Company, 1936-42 Fifth Avenue, Pittsburgh 19, Pa.—A combination of a catalogue of gas analysis apparatus for laboratory use and a manual for gas analysts is found in Catalogue 80, issued by this company. Of particular interest are the flue gas analyzers. An index covering both the catalogue and the manual is very helpful.

Chicago Belting Company, 113 N. Green St., Chicago 7, Ill.—A valuable reference book for users of leather packings is the revised edition of the "Handbook on Hydraulic and Pneumatic Leather Packings," including leather packing and design and applications, with dimensional standards, now obtainable from this company. This book is well illustrated and spiral bound.

The J. E. Doyle Company, 1220 W. Sixth Street, Cleveland 14, Ohio—A folder describing the Doyle Infrared Dryer for faster drying in industrial applications, also the Doyle Vacuum Sheet Cleaner, the Doyle-Allen Ink Distributor, Doyle Electric Sheet Heater and appliances for the printing business, is now available.

Fairbanks, Morse & Company, Turbine Pump Department, Pomona, Calif.—Recent releases from this company include two bulletins: Publication AQB400.1; dealing with the Fairbanks-Morse Figure 6920 Oil Lubricated Turbine Pump, and the other, AQB500.1, describing their low-lift large capacity pumps known as Fairbanks-Morse Niagara Propeller Pumps which are used as circulating pumps in many industrial processes.

General Electric Company, Schenectady, N. Y.—Now available from this company is Bulletin No. GEA-3682-B, on sintered-alnico magnets which are widely used in control devices, motors, meters, etc. Also available is Bulletin No. GEA-4324, on electric tachometers for measuring speed. Suitable equipment may be had for paper machines, as well as pulverizing, hoisting and conveying machinery.

The B. F. Goodrich Company, Akron, Ohio—Now available upon request is a new catalogue section No. 2186 on "Open End V-Belting." Rules for successful application of this type of belting are given, including the method for determining pitch length, allowances for fastener length and for tension. Limitations of this type of installation are outlined and the fasteners described.

Goulds Pumps, Inc., Seneca Falls, N. Y.—An informative and interesting booklet, "Goulds Pumps at War," has been issued by Goulds Pumps, Inc., to tell the story of the importance of pumps in the war effort. Users of pumps will appreciate the official photos of the application of pumps to the war effort, as well as the illustrations of various types of pumps. The book is done in offset with plastic binding.

The Hays Corporation, Michigan City, Ind.—Those interested in the automatic control of industrial processes should send for the handsome new booklet, Bulletin No. 45-713, entitled, "Hays Instruments and Controllers in Industry," put out by the above company. Schematic drawings of typical applications of instruments and controllers to such industrial control problems as: pressure reducing, pressure relief or back pressure, rate of flow, turbine-driven compressor control, and control of speed, liquid level and liquid density are featured. Instruments and controllers applicable to these problems are illustrated and described in detail.

Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.—Under the title of "Barometric Condensers," a new bulletin announced by this company covers both the disc-flow and ejector-jet types, explaining uses, advantages and operation of each. The workings of these vacuum-producing systems are illsutrated by schematic diagrams and photographs showing condensers in various industries. The bulletin may be obtained from the New York office, or any of the branches of this company, by asking for Form 9012. Another bulletin, "Steam-Jet Ejectors," Form 9013, is also available, and should be of interest to all industries having need for vacuum-producing equipment. The booklet gives operating characteristics, principles and features, as well as construction details and schematic diagrams of various single and multi-stage setups. Photographs show the line of ejectors and accessories, and typical industrial installations. A third publication is a pocket-size folder, entitled, "Air-Operated Tools for Maintenance, Construc-

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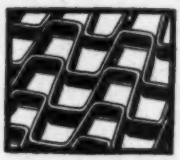

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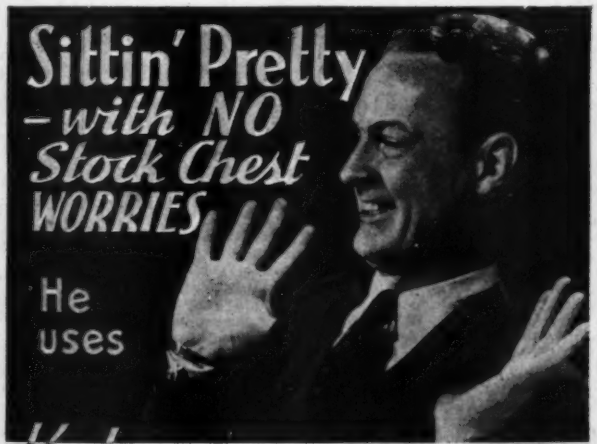

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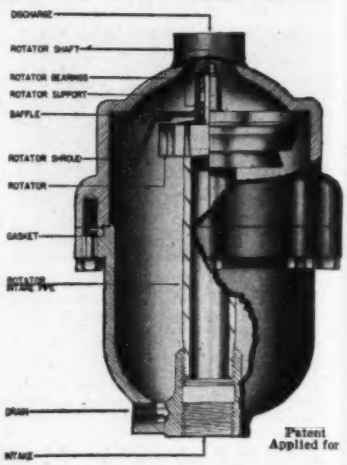

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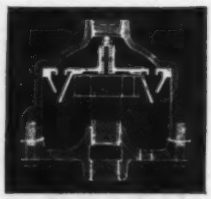

Drawing shows turbo-rotor, shroud and baffles. The design of the baffles precludes the possibility of capillary action of entrainments resulting from high velocity.

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tion, Demolition." The line of I-R air tools and portable compressors available can be seen at a glance. The photos illsutrating the air tools show them at work on construction, demolition and plant maintenance jobs, including new uses for these tools. The folder is Form 117.

The Johnston & Jennings Company, 864 Addison Road, Cleveland 14, Ohio—Now ready for distribution by this company is Bulletin No. R-181, describing Rusta Restor, the cathodic, i. e. electrical method which prevents rusting of steel water tanks, piping and other steel structures. Of special interest to paper manufacturers, this booklet illustrates the action with simple experiments, describes the equipment, and includes a table of comparative costs.

Louisville Drying Machinery Company Unit, General American Process Equipment, 450 Baxter Avenue, Louisville 4, Ky.—A new bulletin, No. 52-514a, describing Louisville rotary dryers, has just been published. Different types for medium and heavy duty are described. Requests should be sent to the general sales office, General American Transportation Corporation, 420 Lexington Avenue, New York 17, N. Y. Also available from this office is Bulletin No. 53-514a, on Louisville steam-tube rotary dryers.

D. J. Murray Manufacturing Company, Wausau, Wis.—A new 12-page booklet, describing corrosion and its influence on unit heaters and their efficient operation has been released by this company. It contains technical information under such headings as "What Is Corrosion," "What Prevents Corrosion," "What Metals are Vulnerable to Corrosion," "Where Certain Metals Should Not Be Used," and "Selection of Proper Unit as Important as Machinery for Production Line." Contains illustrations of cast iron "fin" type unit heaters and installation views.

North American Philips Company, Inc., 100 East 42nd Street, New York 17, N. Y.—An illustrated booklet, 16 pages with illustrations, entitled, "How and Why Cathode Ray Tubes Work," may be had from this company. The text material was written by J. R. Beers, Development Engineer, and is divided into four sections. In Section 1, early history, mathematical concepts, and present-day problems are discussed. Schematic diagrams illustrate the methods by which the tube functions. Screens and their characteristics are also treated at some length. In Section 2 are taken up C-R tube manufacturing problems. Curves and pictorial illustrations are used in the description of materials, assembly and visual inspection. Testing of C-R tubes is the subject matter of Section 3, with photos of screen patterns to identify the defects that are enumerated. Special C-R tube designs are shown in Section 4, including complete television set-ups, as well as lens systems, color filters and three-color screens.

Carl Schleicher & Schuell Company, South Lee, Mass.—Chemical laboratories will be interested in Bulletin No. 67, issued by this company, describing its filter papers. A detailed index of the filter papers and their accessories, based on their classification, will be particularly helpful.

H. W. Porter & Company, Inc., 825 Frelinghuysen Avenue, Newark 5, N. J.—Just published by this company is a four-page bulletin No. 451, entitled "Therm-O-Tile, the Conduit for Underground Pipe Lines." The booklet outlines the advantages of Therm-O-Tile and shows a modified design of Therm-O-Tile for use in exceptionally wet or submerged locations. In two colors, the bulletin is well illustrated.

The Turbo-Mixer Corporation, 247 Park Avenue, New York 17, N. Y.—A bulletin, No. 11-514a, entitled "Turbo-Mixers for the More Difficult Problems of Mixing Liquids with Liquids, Solids and/or Gases," is now available. In the paper industry, these mixers are applicable to size, filler and coating preparation, causticizing, black ash leaching, smelt dissolving, slaking. The booklet is well illustrated with diagrams.

John Waldron Corporation, New Brunswick, N. J.—Just printed is Catalogue No. 118, describing the laminating machines made by this company, which are of special interest to paper and paperboard manufacturers. In addition to photos, the booklet contains many explanatory outlines of laminators. Also included is a brief story of the progress of the art of laminating. The Catalogue is sent free on request to the company.

Yarnall-Waring Company, 102 E. Mermaid Lane, Philadelphia 18, Pa.—In Vol. 1, No. 2 of the Yarway News is announced a new 16 mm. Kodachrome and sound motion picture which has been released by this company, to be shown before technical societies, trade groups, engineering schools, and engineers and operating men in industry. The film features steam traps such as used in paper mills, valves, alarm water columns, water gauges, expansion joints and liquid level indicators made by this company.

J. A. Zurn Manufacturing Company, Industrial Division, Erie, Pa.—Recently published by this company, "Fluid Handling Equipment Catalogue No. 45" describes its complete line of tested devices for the protection of operating equipment connected with the piping systems utilized in industrial, processing and power plants. It features suction and pressure line fittings, such as

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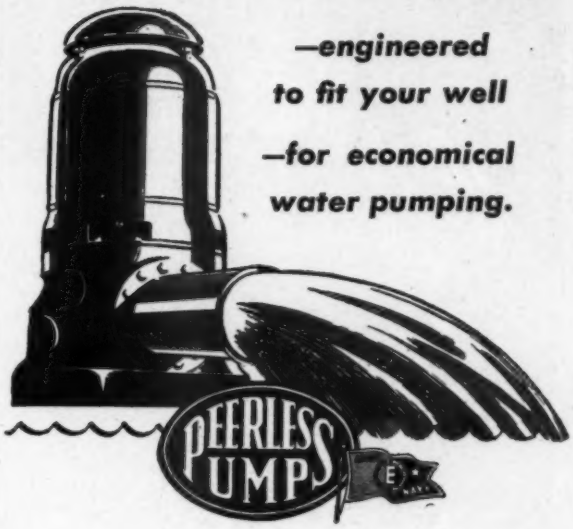

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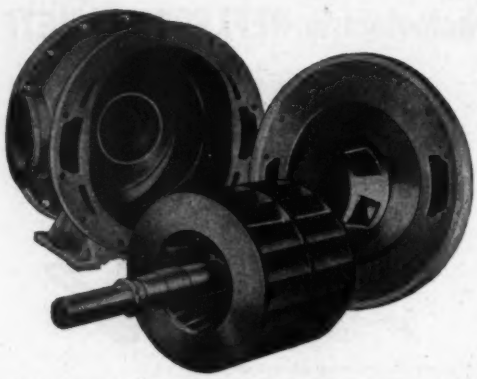

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strainers, and remote valve control assemblies, as well as interceptors for grease, wax, fats, oils, lint and solids, also vents, valves and drains. It is well illustrated with photos and diagrams.

Books

The Chemical Process Industries—R. Norris Shreve, Professor of Chemical Engineering, Purdue University, is the author of this volume. His objectives in preparing the text were to present the various chemical processes in a generalized form through the correlation into flow sheets and descriptive text of the following: unit processes (chemical change); unit operations (physical change); physical chemistry (equilibriums and reaction rates); economics (costs, statistics and consumption); and energy and power (chemical as well as electrical and mechanical). Broad principles rather than details have been emphasized, throughout the text.

Among the 39 chapters are the following: Unite Processes and Unit Operations; Water Conditioning and Waste-Water Treatment; Fuels, Power, and Air Conditioning; Cements, Calcium and Magnesium Compounds; Salt and Miscellaneous Sodium Compounds; Soda Ash, Caustic Soda, and Chlorine; Sulfur and Sulfuric Acid; Hydrochloric Acid and Miscellaneous Inorganic Chemicals; Paint, Varnish, Lacquer, and Allied Industries; Oils, Fats, Waxes; Soap and Other Surface-Active Agents; Sugar and Starch Industries; Fermentation Industries; Wood Chemicals; Pulp and Paper Industries; Synthetic Fibers; Plastics; and Intermediates, Dyes, and Their Applications.

There is both an author and a subject index. The book totals more than 950 pages. It is priced at $7.50 a copy. The publisher is McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 18, N. Y.

Lithographic Offset Press Operating—This work is in two volumes—and has been issued by the Lithographic Technical Foundation, Inc., New York City. It is basically the work of David J. MacDonald and Charles W. Latham of the Foundation education and employees training staff. Volume I is devoted to the subject of Preparing and Starting the Press. Its aim is to present a clear picture of the general preparations and necessary steps to be taken before actually running any lithographic offset press whether in a large, medium or small shop.

In the preparation of this material, the Foundation acknowledges the assistance of Brett Lithographing Company, T. Flavell of Lithographers National Association, A. E. Giegengack of the U. S. Government Printing Office, T. Makarius of Fuchs & Lang Inc., and R. P. Tyler of Harris-Seybold-Potter Company.

Volume II deals with conditions during actual operation of the lithographic offset press. Both volumes are illustrated, and the work is all treated in a practical sense—it is not just theoretical. This material has been prepared for distribution to the members of the Foundation. New members of the Foundation may avail themselves of this valuable material. Any inquiries should be addressed to the Lithographic Technical Foundation 220 East 42nd St., New York 17, N. Y.

Manpower in Marketing—This book written by Eugene J. Benge, is broadly divided into four parts.

Part One takes up the selection of sales personnel and treats the subject under the following headings—The Manpower Problem, Where Do Good Salesmen Grow?, Who Makes the Grade?, Sales Selection, Measuring the Applicant's Qualifications, Testing for Mental Abilities, Testing Adaptability and Social Development, and Behind the Firing Line.

Training is the broad subject of Part Two. This part is made up of six chapters: namely, Breaking Ice for the New Employee, Swim or Drown, Conference Method in Sales Training, Other Formal Training Devices, Reaching Salesmen in the Field, and Retail and Chain Store Training.

The subjects of Part Three on Incentives are: When the Ghost Walks, Quotas and Quota Setting, and Evaluating Individual Sales Effort.

Two chapters make up Part Four on Supervision. Chapters are entitled: Sales Planning, and Sales Control.

Published by Harper & Brothers, 49 E. 33rd Street, New York 16, New York, the book is priced at $4.00 a copy.

The Paper Year Book (1945 Edition)—The title is new but this annual edition for two previous issues was known as The Paper Sales Year Book. Of the same general make up as its predecessors, the book for the most part is devoted to a very extensive paper and paper products data section. This section, totaling nearly 400 pages, presents basic information on an almost limitless list of papers, paper products and related specialties. An alphabetical index to the various products supplements the section as an aid to the rapid use of the book in checking product information.

There also is a section on paper markets; a section of useful data for paper salesmen; an alphabetical index of manufacturers of paper, paper products and related items; and an index to advertisers.

Priced at $7.50 a copy, the book is published by Davidson Publishing Company, 612 North Michigan Avenue, Chicago 11, Illinois.

BELT LACING and FASTENERS for transmission and conveyor belts

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ALLIGATOR

Trade Mark Reg. U. S. Pat. Office

STEEL BELT LACING

World famed in general service for strength and long life. A flexible steel-hinged joint, smooth on both sides. 12 sizes. Made in steel, "Monel Metal" and non-magnetic alloys. Long lengths supplied if needed. Bulletin A-60 gives complete details.

FLEXCO HD

BELT FASTENERS AND RIP PLATES

For conveyor and elevator belts of all thicknesses, makes a tight butt joint of great strength and durability. Compresses belt ends between toothed cupped plates. Templates and FLEXCO Clips speed application. 6 sizes. Made in steel, "Monel Metal", non-magnetic and abrasion resisting alloys.

By using Flexco HD Rip Plates, damaged conveyor belting can be returned to satisfactory service. The extra length gives a long grip on edges of rip or patch. Flexco Tools and Rip Plate Tool are used. For complete information ask for Bulletin F-100.

Sold by supply houses everywhere

"CONVEYOR BELTS EASILY FASTENED"

FLEXIBLE STEEL LACING CO.

4606 Lexington Ave.
Chicago 44, Ill.

for ABSORBENT papers

When Johnny comes marching home he will want the same absorbent paper conveniences he has been using in camp and even at the war front.

Are you ready for the increased demand that will come when the Axis is downed for the count?

Yes — we'll all work and win the war first, then we will put the returning heroes back on the job of serving the home front.

You will make the paper napkins, towels, facial tissues and toilet tissues. We will supply new high production machines for their production. Let us hear from you now!

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MAPICO COLORS

PURE PRECIPITATED OXIDES OF IRON

for PERMANENCE

An outstanding characteristic of these fine pigments is their resistance to color change. They are light-fast and non-reactive to acids and alkalies.

Other qualities which have made Mapico Colors popular with paper makers everywhere are:

HIGH TINTING STRENGTH
GOOD FIBER ADHESION
SOFT TEXTURE
FINE PARTICLE SIZE

In spite of the fact that production of Mapico pigments is at its peak, heavy requirements for war production may make it difficult for you to secure desired quantities. Your patience in this respect is appreciated.

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We will gladly send samples and complete technical information

COLUMBIAN CARBON COMPANY

MAGNETIC PIGMENT DIVISION

MANUFACTURER

BINNEY & SMITH CO., *Distributor*

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CURRENT MARKET QUOTATIONS

RAGS (Domestic)

NEW RAGS

OPA ceiling prices in sales to consuming mills delivered buyer's usual receiving point, with brokers' allowance not in excess of 5 per cent.

	per cwt.
Blue Overalls	–5.50
Corduroy, Men's	–3.50
Corduroy, Ladies'	–3.00
Washables, No. 1	–3.00
Percales	–4.75
New Soft Blacks	–3.75
Light Prints, No. 1	–4.50
Khaki Cuttings—	
Bleachable	–4.25
Unbleachable	–3.50
New White Canvas	–4.50
New Mixed Blacks	–3.25
Canton Flannels, Bleached	–7.00
Shirt Cuttings—	
New White No. 1	–7.25
No. 1 White Headings	–7.25
White Shrunk	–5.00
Silesias No. 1	–5.75
New Unbleached	–7.50
Fancy	–3.50
Linen Cuttings—	
American	–5.00
White	–14.00
Gray	–14.00

RAGS (Domestic)

f. o. b. New York City

OLD RAGS

OPA ceiling prices in sales to consuming mills f. o. b. cars at points of shipment, with brokers' allowance of $1 to $2 a ton depending on the value of the grade involved.

	per ton
Roofing—	
No. 1	31.00
No. 2	29.00
No. 3 and No. 4	27.00
Twos and Blues—	
Repacked	44.00
Thirds and Blues—	
Repacked	44.00
Miscellaneous	36.00
Whites, No. 1—	
Repacked	76.00
Miscellaneous	64.00
Whites, No. 2—	
Repacked	58.00
Miscellaneous	53.00

RAGS (Foreign)

ex dock New York City

NEW RAGS	per cwt.
New Dark Cuttings	Nominal
New Mixed Cuttings	
New Light Silesias	
Light Flannelettes	
Unbleached Cuttings	
New White Cuttings	
New Light Oxfords	
New Light Prints	

RAGS (Foreign)

ex dock New York City

OLD RAGS	per cwt.
No. 1 White Linens	Nominal
No. 2 White Linens	
No. 3 White Linens	
No. 4 White Linens	
No. 1 White Cottons	
No. 2 White Cottons	
No. 3 White Cottons	
No. 4 White Cottons	
Extra Light Prints	
Ord. Light Prints	
Med. Light Prints	
Dutch Blue Cottons	
French Blue Cottons	
French Blue Linens	
Checks and Blues	
Linsey Garments	
Dark Cottons	
Old Shappories	

ROPE and BAGGING

f. o. b. and ex dock New York City

	per cwt.
Gunny No. 1—	
Foreign	Nominal
Domestic	3.25 to 3.50
Wool Tares—	
Light	3.50 to 3.75
Heavy	3.75 to 4.00
No. 1 Scrap Bagging	2.75 to 3.00
Manila Rope—	
No. 1 large	–*115.00
No. 1 small	–*105.00
Sisal Rope—	
No. 1 large	–*95.00
No. 1 small	–*80.00
New Burlap Cuttings	5.50 to 6.00
Jute Threads—	
Foreign (Nom.)	6.00 to 6.50
Domestic	5.50 to 6.00
Strings—	
No. 1 sisal	–*80.00
No. 2 sisal	–*60.00
Soft jute	5.00 to 5.50
Mixed	1.75 to 2.00

*OPA ceiling price per ton f. o. b. shipping point.

WASTE PAPER

OPA ceiling prices f. o. b. points of shipment for machine compressed bales weighing not less than 500 pounds (with differential of $5 per ton less on certain grades for loose or bundled stock), and brokers' allowance of 4 to 9 per cent.

	per ton
Shavings—	
White Env. Cuts, One-Cut	67.50–
Hard White Env. Cuts	62.50–
Hard White, No. 1	57.50–
Soft White, No. 1	50.00–
Soft White, One-Cut	57.50–
Soft White, Misc.	43.00–
Fly Leaf, No. 1	33.50–
Fly Leaf, Woody, No. 1	25.00–
No. 2 Mixed Col. Woody	18.00–
Flat Stock—	
No. 1 Heavy Books and Magazines	38.50–
Mixed Books	22.00–
Ledger Stock—	
No. 1 White	46.00–
No. 1 Mixed (Colored)	40.00–
Manilas—	
New Env. Cuttings	53.00–
New Env. Cuts, One-Cut	57.50–
Extra Manilas	30.00–
Manila Tab Cards, Free of Ground Wood	45.00–
Ground Wood Manila Tab Cards	27.00–
Kraft—	
Envelope Cuttings	65.00–
Mixed Env. or Bag Cuts	55.00–
Tripled Sorted No. 1 Brown	50.00–
New 100% Cor. Cuts	45.00–
No. 1 Old Assorted	35.00–
News—	
White Blank	33.00–
Overissue	22.00–
No. 1 Baled	30.00–
Old Corrugated Containers	28.00–
New Corrugated Cuts	18.00–
Mill Wrappers	22.00–
Box Board Chips	14.50–
No. 1 Mixed Paper	19.50–

CHEMICALS

f. o b. shipping point

Alum (Papermakers)—	
Lump, cwt.	4.25–
Ground, cwt.	4.00–
Powdered, cwt.	4.40–
Blanc Fixe—	
Pulp, bulk, ton	48.00 to 48.50
Dry, barrels, pound	6.00 to —
Bleaching Powder—	
Drums, cwt.	2.25 to 3.10
Casein (Domestic Standard)—	
30-30 mesh (bags), lb.	24.00 to 24.75
80-100 mesh (bags), lb.	—
Argentine, lb.	18.00 to 19.00
China Clay—	
Domestic Filler Bulk (mine) ton	8.50 to 16.00
Domestic Coating Bulk (mine) ton	11.00 to 22.00
Imported (ship side) Bulk (lump) ton	14.00 to 30.00
Chlorine—	
Tank cars (wks) cwt.	2.00 to 2.25
Gelatine (silicin), lb.	.90 to .95
Glye. (C.P.) drums, lb.	15.25 to 15.75
Litharge, powd., bbl., lb.	.09 to —
Rosin (Gum)—	
New York, per 100 lbs.	
E	6.75—
F	6.85—
G	7.00—
WW	8.00—
Rosin (Wood), carlots	4.50–
Salt Cake—	
Dom. bulk (wks) ton	15.00 to 16.00
Imp. bulks on dock— (Atl. ports) ton (Nom.)	29.00 to —
Soda Ash—	
Bulk (works), cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.35
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—	
Solid, drums, cwt.	2.30–
Ground and flake, drums, cwt.	2.70 to 2.95
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.65 to 2.05
40 deg., 55 gal. drums, (works) cwt.	.80 to 1.45
Starch—	
Pearl, 140 lb. bags, cwt.	3.72–
Pearl, barrels, cwt.	3.83–
Paper (Sp.) bags, cwt.	3.83–
barrels, cwt.	3.92–
Sulphur (Crude)— (Mine) bulk, long ton	16.00 to—
Talc—	
Dom. 100 lb. bags (mine) ton	16.00 to 21.00
Imp. bulk, ton (Nom.)	—
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05¾ to .06
Calcium Pig., bbls., lb.	.05 to .05¼
Zinc Sulphide, bbls., lb.	5.60 to 5.85

WOOD PULP

OPA maximum prices applicable to wood pulp delivered to consumer mills located East of the Continental Divide exclusive of Denver, Colo. (West of the Continental Divide and in Denver, Colo., ceilings are $6 per ton lower):

Bleached softwood sulphite	86.00
Unbleached softwood sulphite	74.00
Bleached hardwood sulphite	83.50
Unbleached hardwood sulphite	71.50
Northern bleached sulphate	86.00
Southern bleached sulphate	79.00
Northern semi-bleached sulphate	82.00
Southern semi-bleached sulphate	75.00
Northern unbleached sulphate	73.00
Southern unbleached sulphate	63.50
Bleached soda	76.00
Unbleached soda	72.00
Ground wood pulp	56.00
Ground wood—paper machine dried and mutilated	53.00
Sulphite screenings	43.50
Sulphate screenings	33.00
Ground wood screenings	32.00
Northern unbleached sulphate sideruns	73.00
Southern unbleached sulphate sideruns	63.50
Standard news print sideruns	50.00

PAPER

f. o. b. New York City

Boards—	per ton
Binders	54.00–
Chip	50.00–
Chip, tube and can	52.00–
Chip, full-blending	54.50–
Chip, sgl. mla. lined	62.00–
Coated, white patent .016	80.00–
.020 and heavier	75.00–
Kraft liner	63.00–
News	50.00–

Book Papers—OPA base maximum prices per cwt. 4 cases or equivalent, f. o. b. mill with quantity, weight, manufacturing and other differentials allowed:

Uncoated (Untrimmed)

Book, White (M. F.)—	
A Grade E. F.	8.25
B Grade E. F.	7.80
C Grade E. F.	7.55
D Grade E. F.	7.30
E Grade E. F.	7.05
No. 2 Uncoated Offset 4 sides. White Coated White (Trimmed 4 sides)	8.45
No. 1 Glossy	11.90
No. 2 Glossy	10.85
No. 3 Glossy	10.15
No. 4 Glossy	9.80
No. 5 Glossy	9.30
C2S Offset	10.40
C1S Litho (Varnish)	10.00
C1S Litho (Non-Varnish)	9.80

Writing Papers—OPA base maximum prices per cwt. on writing papers, f. o. b. mill with zone, quantity, packing and other differentials allowed:

Rag Content Bond—	per cwt. 20 lb.	16 lb.
Extra 100% Rag	34.00	34.00
100% Rag	28.00	28.00
75% Rag	20.00	20.00
50% Rag	16.00	17.25
25% Rag	14.00	15.00

Rag Content Ledger—	per cwt. Zone 1
Extra 100% Rag	35.00
100% Rag	29.00
85% Rag	24.00
75% Rag	21.00
50% Rag	17.40
25% Rag	15.00

Sulphite Bond—	per cwt. 20 lb.	16 lb.
Air dry, watermarked	12.75	13.70
No. 1 (M. F.) watermarked	9.00	9.70
No. 2 (M. F.) watermarked	8.25	8.85
Plain (M. F.) unwatermarked	7.60	8.20

Sulphite Ledger—	per cwt. Zone 1
No. 1 (M. F.) watermarked	10.00
No. 2 (M. F.) watermarked	9.25
Plain (M. F.) unwatermarked	8.60

Glassine (f. o. b. mill)—	per cwt.
Embossed (25 lb. up)	13.75 to 14.25
Bleached (25 lb. up)	12.75 to 13.25
Unbleach. (25 lb. up)	11.50 to 12.00
Greaseproof—	
Bleach. (25 lb. up)	11.00 to 11.50
Unbleach. (25 lb. up)	10.00 to 10.50

News—OPA Ceilings—	per ton
Rolls, Standard (Contract)	61.00
Rolls, Lightweight (Cont.)	65.00
Rolls (Spot)	(Nominal)
Sheets	69.00

Tissues (Carlots)—	per ream
White, No. 1	1.12½ to 1.19
White No. 2	.90 to 1.00
Bleached Anti-Tarnish	1.15 to 1.20
Colored	—
Anti-Tarnish Kraft	.70–
Manila	.90 to .95
Napkins, semi-crepe (12¼ lb. to M shts.) per cs.	.80–
Napkins, full crepe and emb'sed (12¼ lb. to M shts.) per cs.	.60–
Toilet, Bleached (M shts.) per cs.	5.45–
Toilet, Unbleached (M shts.) per cs.	4.25–

Towels—	per cats
Bleached	3.20 to 3.75
Unbleached	2.60 to 3.05

Wrappings (Kraft)—	per cwt.
Super-Standard	5.25 to 7.05
No. 1 Wrapping	5.00 to 7.00
Standard Wrapping	4.75 to 7.15
Standard Bag	4.87½

Wrappings (Sulphite and Bleached Kraft)—	per cwt.
(Rolls, f. o. b. mill)	
Bleached Papers—	
M.F. & M.G. Waxing, 20 lb. (Carloads only)	7.25 to 7.50
(10,000 lbs.)	7.50 to 7.75
Drug wrapp. 25 lb.	7.00 to 7.25
Unbleached Papers—	
Com. Grd. Butch. 40 lb.	5.50 to 5.75
No. 1 Butchers	5.75 to 6.00
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.25 to 6.50
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.00 to 6.25
Steam Finish, 50 lb.	5.00 to 5.25
Water Finish, 40 lb.	5.50 to 5.75

Manilas—	
Envp. Mla., Sub. 16-40 (No. 1)	6.00 to 6.50
Envp. Mla., Sub. 16-28 (No. 2)	5.75 to 6.00
Envp. Mla. (Prices based on large sheets untrim'd ream-marked, in bdls.)	
Wrapp. Mla. 35 lb. up—	
No. 1	6.00 to 6.25
No. 2	5.75 to 6.00
M.G. Sulphite and Kraft (other than Waxing)	
Grade A-22 lb.	7.20 to 7.40
Grade B-20 lb.	6.75 to 7.00

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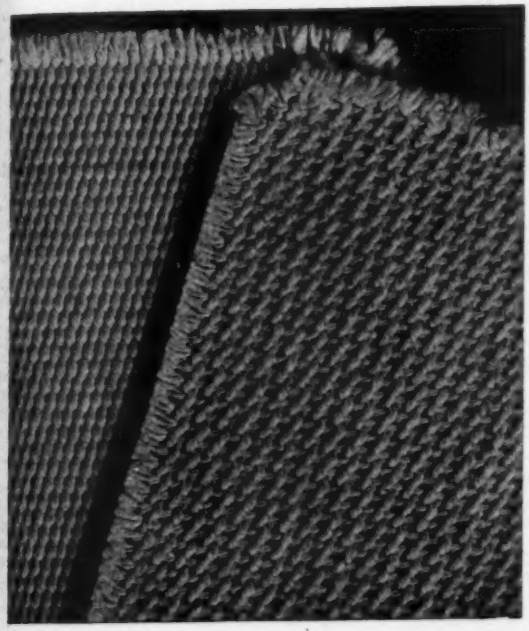

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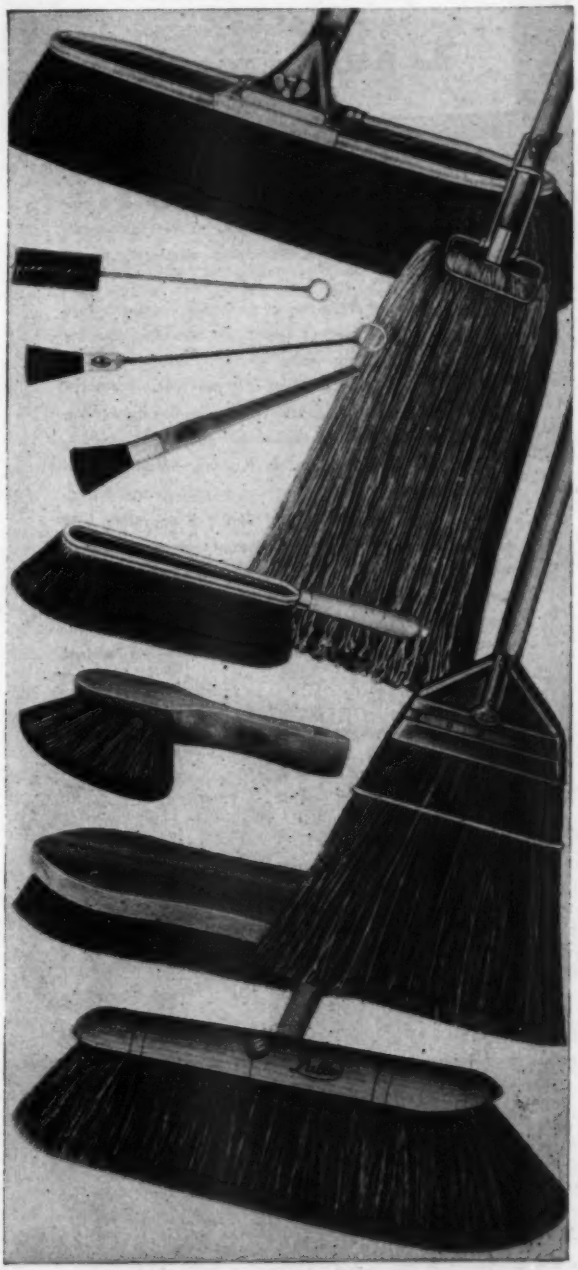

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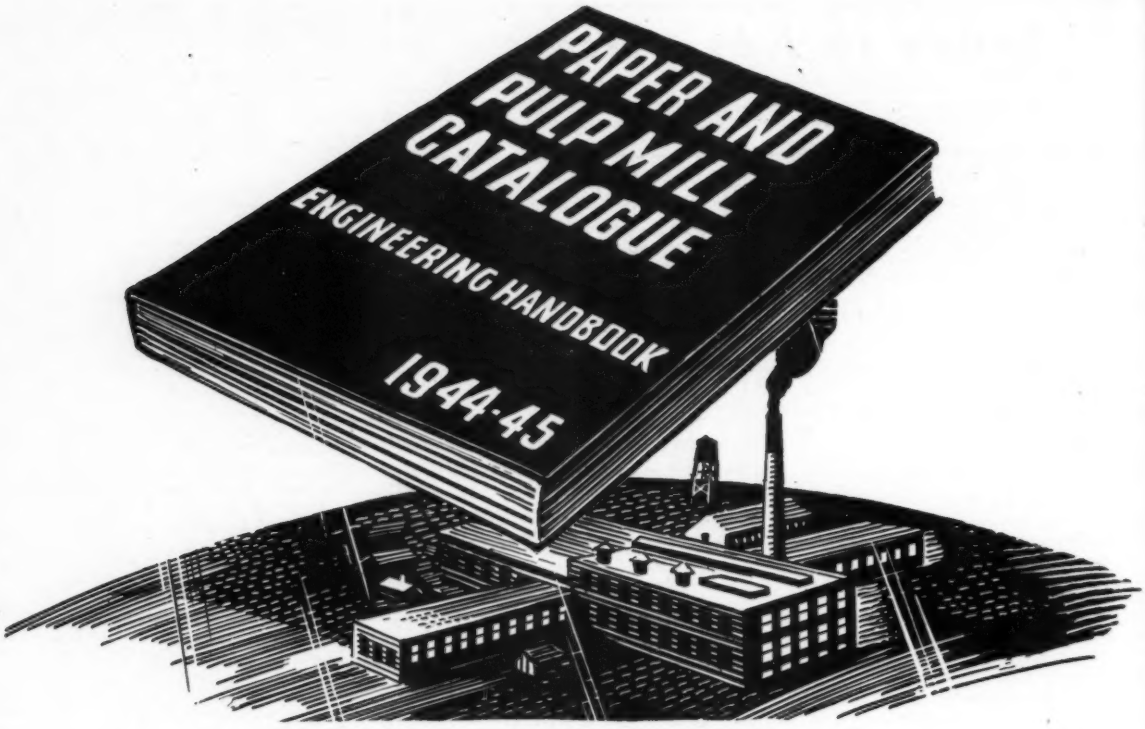

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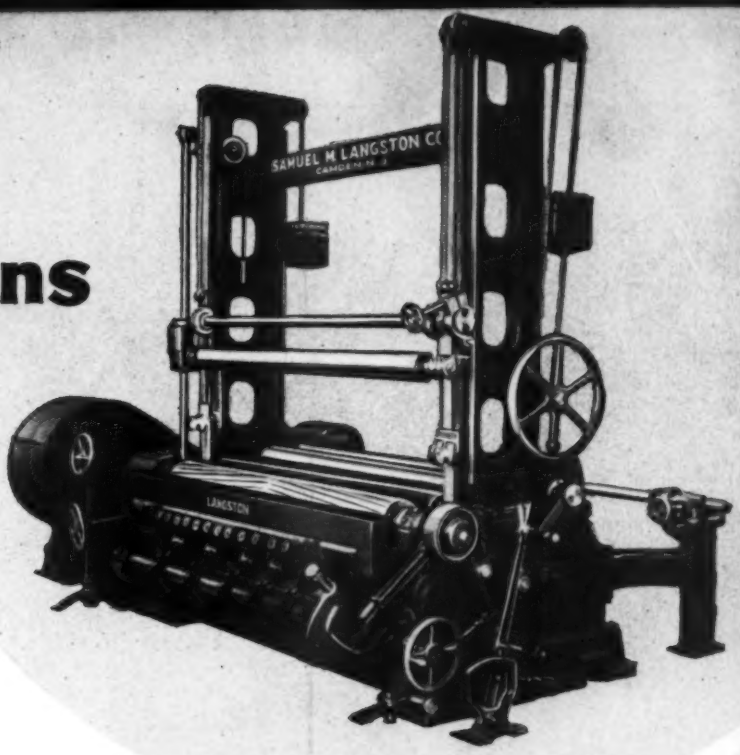

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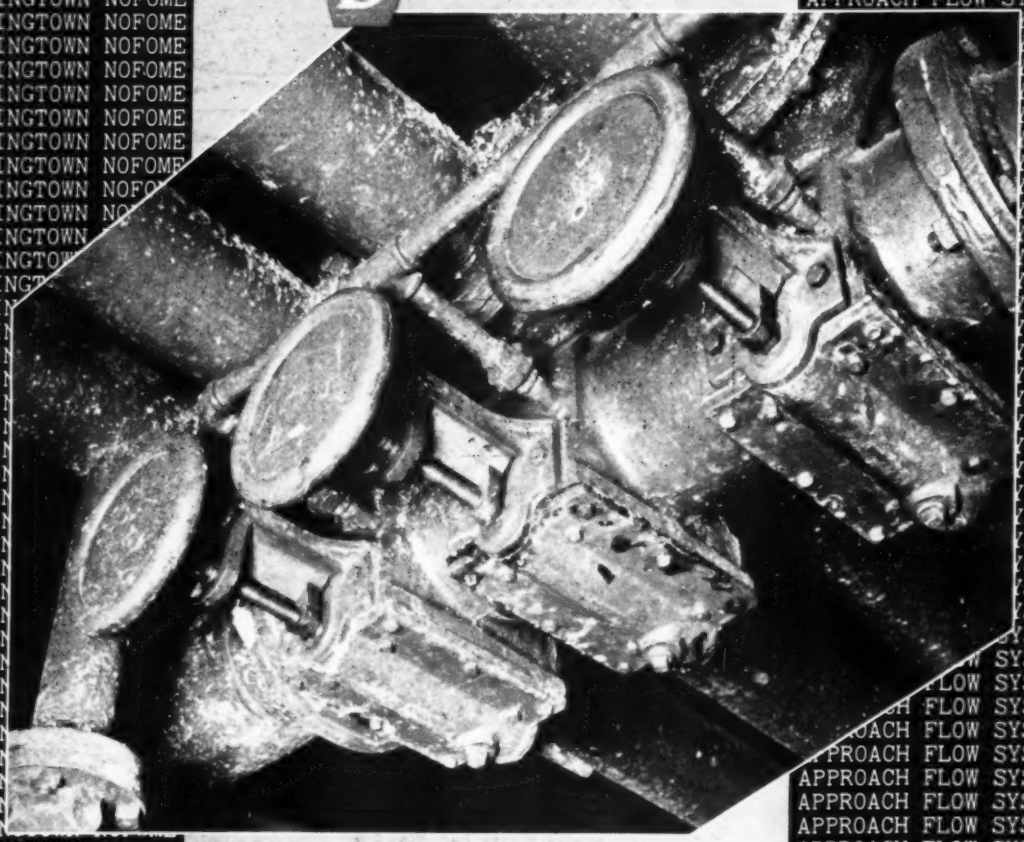

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